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ABSTRACT

The papers in this document represent statements prepared by scholars involved in various stages of 4 multi-state regional research projects on rural community services and presented at a 1971 national workshop on research problems in delivery of community services. The 2 major foci of these papers are (1) problems of measurement and assessment of adequacy of community services and (2) organization of service delivery systems. The 8 papers included are Problems of Measurement and Assessment of the Adequacy of Community Services: A Naive Viewpoint; Adequacy of Community Services: A Measurement Problem; Theoretical Concerns in the Measurement of Adequacy of Community Services and How to Assess Them in the Rural Areas; Rural Development and the Quality of Life in the Rural South: Concepts and Indicators in the S-79 Regional Project; Some Methodological Considerations for Rural Community Services Research; Organization of Public Service Delivery Systems for Rural Areas; Some Relevant Concerns and Issues in Research on Personal Health Delivery Systems with Special Emphasis on Nonmetropolitan Areas; and, Housing Quality: Measurement and Assessment. (PS)

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Foreword

By the Spring of 1971 there were organized in the U. S. four multi-state research projects dealing either wholly or in part with the provision of rural community services. These projects, working under the sponsorship of state Agricultural Experiment Stations and the U. S. Department of Agriculture, had identified a set of conceptual and measurement issues in the arena of community services research. Although each project operated separately from the three others, lines of communication did exist among all four projects.

During early Summer, the idea emerged among the projects' researchers that some form of collaboration across regional boundaries might be productive. The Cooperative State Research Service, U.S.D.A., took the initiative for action and sponsored a planning meeting with representatives attending from each of the four regions, Northeast, Southern, North Central and Western.

At this session, agreement was reached that collaboration would be productive, a meeting having a workshop format would be suitable, and in order to maximize long-term utility of the meeting, most contributions for papers and discussion leaders would be sought from within the research projects' personnel rather than from outside experts. Two major program foci were also selected; first, problems of measurement and assessment of adequacy of community services and, second, organization of service delivery systems. For both of these two foci each of the four regional projects agreed to prepare a paper. The purpose of these eight papers was to provide a base for discussion at the Workshop to be held in December. As such, the content of the papers was to be tentative, exploratory and provocative, in contrast to polished articles reporting completed research.

The eight papers bound together in this publication represent, therefore, statements prepared by scholars at varying stages of regional research on community services for the purpose of stimulating discussion among colleagues in a workshop setting. The ideas presented are exciting and timely. The issues are as current as our daily newspapers. Our intention in compiling them in their original unexpurgated form is to make them available with as little time-lag as possible to all those who are interested in rural community services research.

S. M. Leadley
University Park, Pennsylvania
March, 1972

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PROBLEMS OF MEASUREMENT AND ASSESSMENT OF THE ADEQUACY OF COMMUNITY SERVICES: A NAIVE VIEWPOINT*

Paul H. Gessaman and Gordon D. Rose[1]

In the preparation of this discussion, we have considered our role to be that of identifying issues which we believe must be considered and, if possible, resolved if we are to adequately carry out research on the provision of community services. We recognize that the group of issues considered here is incomplete. Some of you here today may wish to add to or delete from the list we have identified. And, we hope you will do so.

We would like to start be briefly examining what it is that we are talking about when we speak of community services. To do this we use a very simple model of the economy in which it is assumed that goods and services are produced by a public (tax-supported) sector and a non-public (private) sector. In this model, the consumer is viewed as receiving from both of these sectors that mix (or combination) of goods and services which he consumes. This three-part system (public sector, private sector, and consumer) constitutes our simple model of the economy of a community (see Figure 1). We are implicitly assuming a functioning economy in which the consumer is the person whose needs and desires should be met. Thus, the consumer becomes the final judge of whether or not services are adequate. We will return to consideration of this last idea later in the paper.

As Figure 1 indicates, we view public goods and services as being directly and indirectly utilized by the consumer. Examples of directly utilized public sector goods and services might be: fire protection, police protection, education, public health services, water supply and waste disposal, road systems, and, in some instances, electrical power service.

Additionally, the consumer indirectly utilizes public sector goods and services as an implicit or explicit part of those goods and services he obtains from the private sector. In this case we are thinking especially of those regulatory and control services performed by the public sector which wholly or partially determine the quantity and quality of goods and services produced by the private sector. Examples here include: sanitation and safety requirements for restaurants, food stores, and places where the public assembles; the regulation of fares and tariffs on public carriers; the enforcement of licensing require-

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* Paper presented at National Workshop on the Delivery of Community Services in Rural Areas, Lincoln, Nebraska, December 13-16, 1971.

[1] Extension Economist and Assistant Professor of Agricultural Economics, University of Nebraska-Lincoln, and Extension Economist and Associate Professor of Economics, South Dakota State University, respectively.

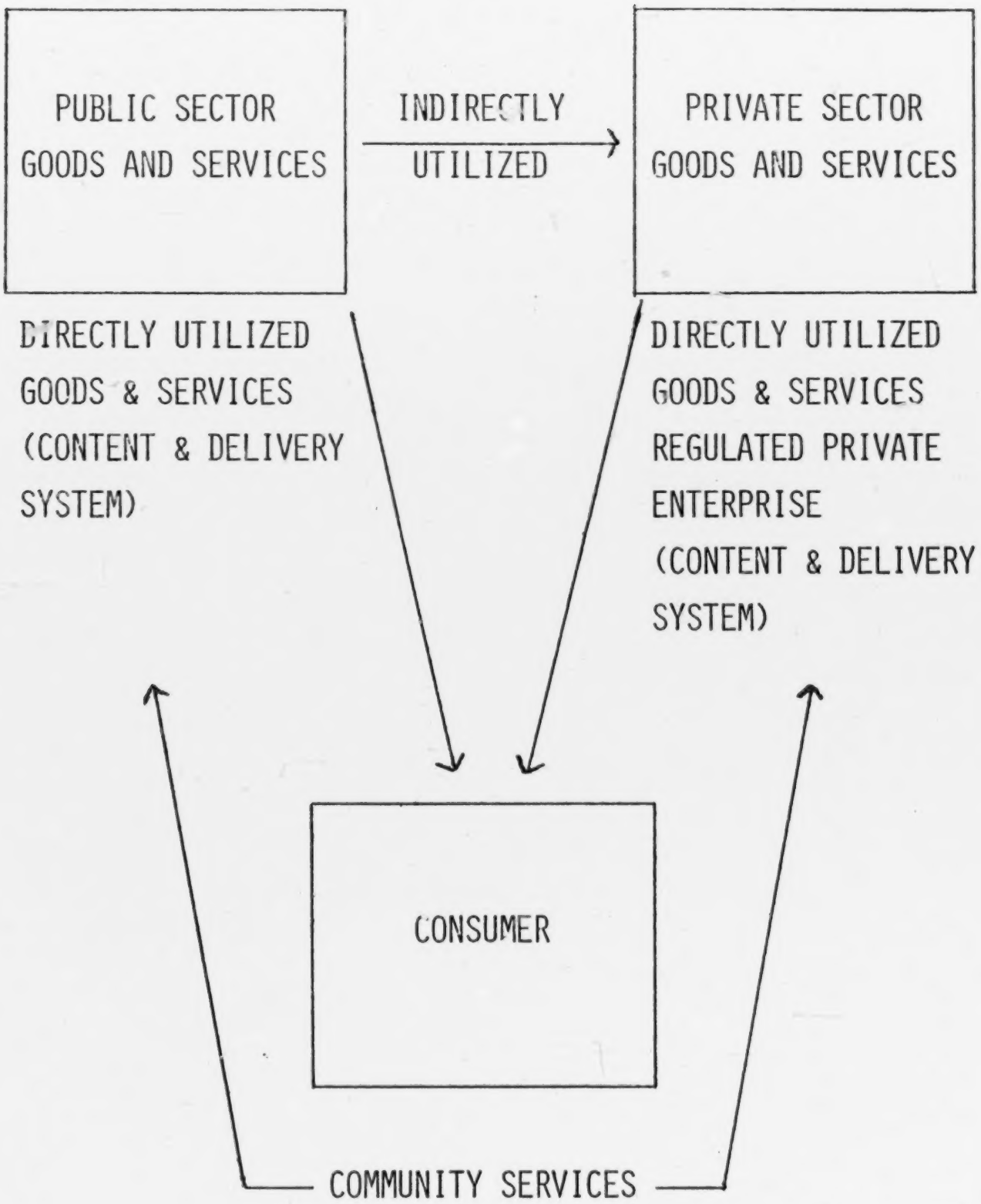

FIGURE 1. A SIMPLE MODEL OF A COMMUNITY

ments for professionals such as architects, doctors and lawyers; and other similar type activites. It might be appropriate to argue here that no part of the private sector is free of regulation, so all private sector goods and services represent indirect utilization of public sector goods and services. This idea is not important to our present discussion, so we will not carry it further.

The indirect utilization by consumers of goods and services provided by the public sector also includes the effects of direct consumption by the private sector of many of the same public sector goods and services that the consumer directly utilizes. Police and fire protection, transportation systems, water and waste disposal systems--these and other outputs of the public sector benefit the productive activities of the private sector and are generally viewed as resulting in lowered costs for the producers of private sector goods and services. Competition is usually sufficient to result in part or all of these reduced costs being passed on to the consumer in the form of lower prices.

The consumer is interested in not only the types and forms of goods and services available for his consumption, he is vitally interested in the efficiency and efficacy of the means by which these goods and services are made available for use. For example, a system for fire protection is useful to the consumer only if it has the capacity to successfully extinguish fires when and where they occur. And, for the consumer to realize maximum benefit, the system must be able to extinguish fires when they occur on public sector or private sector property as well as being able to extinguish fires on the consumer's own property. In accordance with present-day usage, we shall refer to means of making goods and services available by the expression, service delivery systems.

If this model is accepted, the community services in which we are interested become those combinations of content (goods and services) and service delivery systems by which the public sector and the private sector, singly or in combination, provide the consumer with services having part or all of the following characteristics:

1. The services are thought to be necessary for the public good.
2. The services are, or usually should be, utilized by the general public.
3. The means of providing these services are generally set in relatively rigid institutional frameworks that are only partially susceptible to change initiated at the local level.
4. The provision of these services requires high fixed investment of such magnitude that monopolies are common and may be encouraged through exclusive franchises or other governmental actions.
5. The services are not sold, and prices are not set, through the market in the same sense as is the case for most goods and services.
6. Prices for services may not allow the recovery of fixed costs, and may not cover variable cost in some cases.

7. The cost to the consumer of services may remain constant per unit of time regardless of the quantity of the service consumed.

By this definition we include in community services the content and the delivery systems of the closely regulated private enterprise activities. These activities may supplement or complement the activities of the public sector, and in many instances the public sector and the private sector jointly provide the community services. Education, health services, and law enforcement are examples.

We now turn to consideration of adequacy measures. In many instances, adequacy measures appear to take the form of minimum or maximum standards. While there is usually not any formal statement that activities or services complying with these standards are adequate, this appears to become the case in practice. Most states require school attendance through the 8th grade or to age 16, or both, which implies that education to this level is thought sufficient for the least educated members of the society. Does this mean that the educational system is adequate if students attend school for the requisite number of grades or period of years? It appears that society believes that this is so.

In an analogous fashion, we have maximum allowable levels for pesticides, for radiation exposure, for bacteria count in milk, and water quality standards for streams and lakes. Such standards seem to imply that, if the combined efforts of the public and non-public sectors result in conditions such that these standards are met, the content and delivery systems of the appropriate services are adequate.

In following this line of though a bit further, let us look briefly at some of the ways in which these minimum or maximum standards are set.

1. Standards set by professionals operating in their field of technical competence. This type of standard-setting is typical of the health care field where many standards of treatment and patient care are set by members of the medical profession.
2. Standards set by elected or appointed officials. These activities are often carried out by the appropriate officials in close consultation with professionals in that field, and the standards may emerge as administrative edicts or as legislation. Public hearings may be held at which interested parties testify and expert opinions are solicited.
3. Standards set by the courts. The school desegration decision of the Supreme Court, and the more recent decision of a California court requiring schools to have equivalent funds on a per pupil basis are examples of this type of standard-setting.
4. Standards set by consumers through their actions in the political arena and in the market place. The elected officials who fail to provide adequate services may be voted out; the hospital that provides inadequate health care is by-passed by potential patients.

In a larger sense, consumers may set or identify minimum acceptable standards for community services by chosing to move from, or refusing to move to, communities where the level of services is too low.

It is our opinion that standards of the type described here have proven useful and valuable to the communities of our nation, but they do not provide a sufficient basis for the measurement and assessment of the adequacy of community services. Reasons for this include: the tendency for standards to lag behind the needs of the present, the tendency for standards to be set by elected or oppointed officials in ways favorable to pressure groups, and the tendency for the vote of the consumer to be heard too late or too weakly for the standards to be set in a way appropriate to the needs of the community.

If researchers are to measure and assess adequacy, they must successfully deal with a complex of inter-relationships as intricate as any other in our society. For any community service, factors which appear to have bearing on the degree of adequacy of that service include:

1. The quality of the service.
2. The quantity available of the service.
3. The cost per unit and in total of the service.
4. The mix of community services available to community residents. The acceptability of any particular mix will depend on:
   a. The ability of the consumer as an individual, and as a member of a group of consumers in that community, to supply satisfactory substitutes for the community service.
   b. The situational context in which the community services are provided, e.g., the willingness of the consumer to substitute scenery for community services.

In the determination of adequacy, our inability to precisely measure quality and in some cases, quantity factors, makes the determination difficult under the best of circumstances. In cases where no good measure for either quality or quantity can be identified, our conventional tools of economic analysis appear to be inappropriate.

Considerations of adequacy are further complicated by the condition we call, for lack of a better name, dynamic disequilibrium. This can be briefly described as the situation in which expectations change continuously as conditions change, resulting in the constant obsolescense of community services--especially delivery systems. This condition has been especially noticable in the field of education where the "knowledge explosion" guarantees that today's educational system, regardless of its adequacy by today's standards, will be inadequate in the next decade.

In conclusion we would like to suggest four presently unresolved questions which seem to indicate fertile fields for research. We

believe effective research in these areas will require a wider range of research skills, tools and methods than those conventionally used by economists. These unresolved questions are:

1. Who sets the criteria for adequacy? That is, which criteria are set by consumers, which ones by professionals, by officials, and by the courts? And, who sets the criteria where none of these are operational?
2. For any given community, what are the criteria for adequacy of community services? We are thinking here of both the formal criteria set by laws or regulations, court decisions, etc., and the effective or operational criteria that are actually used in decision-making.
3. What are the trade-offs between the various market and non-market factors entering into adequacy determination?
4. Is there something "different" about those services which we have defined as community services that makes our conventional research approaches inappropriate or inadequate for the research we are trying to carry out?

ADEQUACY OF COMMUNITY SERVICES: A MEASUREMENT PROBLEM*

BY

Anne S. Williams

Prepared for Presentation To a
National Workshop on Problems of Research on
Delivery of Community Services in Rural Areas
Lincoln, Nebraska
December 13-16, 1971

*Professor Don A. Dillman, Department of Rural Sociology, Washington State University, contributed substantially to this paper, but has not had an opportunity to review the present manuscript. I also wish to acknowledge the invaluable suggestions of Professor Jack C. Gilchrist, Department of Sociology, Montana State University.

INTRODUCTION

Measurement of adequacy of community services implies the existence of standards, based on value judgments, as to what constitutes "adequate" services. Determination of adequacy standards for a given service area involves a two-fold process: (1) determining the relevant dimensions of what service area (i.e. the dimensions of medical service might include availability of medical doctors, dentists, hospitals, home nursing and prescription drugs), and (2) developing the standard of what constitutes good service for each dimension (i.e. doctors per capita, presence and number of specified medical specialists, hospital bed occupancy rates, etc.). After standards have been set, procedures must be developed for measuring adequacy of services in relation to these standards. Obviously, decisions made at each step of this process will direct and limit the kinds of conclusions which can be drawn, as well as their action implications.

Criteria of service adequacy might depend on "expert judgment" and/or "public judgment". Opinions of professionals providing the given service could provide the "expert judgment" aspect of service adequacy, and the opinions of laymen, or receivers of the service, regarding criteria of adequacy could provide the "public judgment" measure. Either of these approaches, or a combination of both, involves complex problems of measurement since the research design would depend largely on evaluative judgments which are likely to involve extreme variance between informants. For example, neither the individual expert nor the individual laymen is likely to agree with one another or with other experts or laymen.

Variables which obviously would have a bearing on "adequacy", as judged by the expert or layman, would include: (1) knowledge of the present services (i.e. type of facility, number and kind of personnel), (2) knowledge of available technology, and the degree to which available technology is used locally, (3) awareness of existing barriers to the delivery of the service, and (4) measures of "relative adequacy", assuming one has experienced better or worse services elsewhere. In other words, both public and expert opinions are value judgments, based on somewhat unique frames of reference or expectations of what service adequacy should be.

Efficiency and effectiveness. Service adequacy can be reflected in terms of efficiency as well as effectiveness. Efficiency is measurable by at least three variables: (1) presence of available technology, (2) presence of an organizational structure to deliver the service, and (3) the cost of providing the service (i.e. per unit delivered).

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TABLE I

CAPACITY TO BE EFFICIENT

Available Organizational Structure	Available Technology: Present			Available Technology: Not Present		
Present	High Cost A^1	Mod. Cost A^2	Low Cost A^3	High Cost B^1	Mod. Cost B^2	Low Cost B^3
Not Present	High Cost C^1	Mod. Cost C^2	Low Cost C^3	High Cost D^1	Mod. Cost D^2	Low Cost D^3

In the above diagram, consensus could probably be achieved fairly easily with respect to Cell D (i.e lack of adequate community services). However, service adequacy might be fairly difficult to measure with respect to Cells C and B since the result would be affected by value judgment variables. For example, in some communities public perception of adequacy might be morea function of Cell B (whether or not the organizational structure is present), than of Cell C (the presence or absence of available technology) when either one or the other conditions is absent. Cell A likewise could be misleading since the presence of an organizational structure which makes the recipient "feel" he is receiving the service may be more important than the availability of modern technology for administering the service. These four service efficiency possibilities can be subcategorized by a third variable, cost. Obviously, the most "efficient" possibility would be Cell A^3 (available technology, presence of an organizational structure to deliver the service, and low cost to the community).

Effectiveness is a multi-variate dimension as well, and includes at least the following: (1) service outcome, (2) distribution, and (3) goal choice.

TABLE II

CAPACITY TO BE EFFECTIVE

Service Outcome	Distribution: High			Distribution: Low		
Positive	Best Goals A^1	Mod. Goals A^2	Worst Goals A^3	Best Goals B^1	Mod. Goals B^2	Worst Goals B^3
Negative	Best Goals C^1	Mod. Goals C^2	Worst Goals C^3	Best Goals D^1	Mod. Goals D^2	Worst Goals D^3

Since effectiveness is a measure of how well desired service outcomes are achieved, we can speak of "positive" and "negative" service outcomes as shown on the above diagram. Distribution, or the degree to which the service is available to all groups within the community (high distribution or low distribution) should also be considered as a measure of effectiveness. However, consideration should likewise be given to "community goals", since a community may select service goals which cannot possibly me met within the resources of the community (Cells C3 or D3), or may select goals that are inappropriate in terms of the community's needs: even though these goals are achieved (Cells A3 and B3). The capacity of the community to be effective in delivering adequate services is a function of service outcome, service distribution and goal choice as shown in the above diagram, as well as a function of the efficiency with which the community delivers the service.

TABLE III

CAPACITY TO BE EFFICIENT AND EFFECTIVE

Effectiveness	Efficiency: Low	Efficiency: High
Low	A	B
High	C	D

Cell C of the above diagram is obviously the best possible combination of community resources, and decisions with regard to utilization of those resources. On the other hand, Cell B is the dichotomous extreme, or the worst possible utilization of a community's resources. I suspect Cells A and D describe conditions one would more likely find in most rural communities. It is very possible that we would find some rural towns in which the community's ability to be effective is hampered by the financial resources available to that community and therefore we would find a condition as illustrated in Cell A. The community is utilizing its available resources with the utmost efficiency but it's effectiveness is low because the resources are not adequate to the task at hand. In this instance, we might wish to re-examine the community's choice of service goals as shown in Table II.

A TYPOLOGY FOR MEASURING SERVICE ADEQUACY

The variables mentioned above can be taken into consideration in the following approach to measuring adequacy of community services. Those analytic foci which seem most important include:

"Established standard" focus. A first step would be to establish an adequacy standard prior to the study. Standards can be established in any of the three ways listed below or by combination of these alternatives: (1) Established by a national body, by state law, etc.,

or any readily acknowledged collective consensus. (2) Arbitrarily established by the researcher for comparative purposes only. Such a standard would merely serve as a tool for comparative analysis. (3) A minimum standard needed as a prerequisite to meet other community needs. For example, certain industries select industrial sites on the basis of the availability of transportation, recreation facilities, health care, educational system, etc.

Objective information regarding the existing service. A second step on measuring service adequacy is to document the characteristics of existing services.[2] It would be important to ask questions such as: (1) Does the service exist? (2) Is available technology employed? (3) How many and what kinds of personnel are available? (4) Who uses the service? (5) Is the service accessible to all segments of the community? Inherent in this method are at least two problems: (1) analysis of existing services are subject to measurement error caused by misinformation from human informants as to "what is", and (2) differential record keeping and differential access to information compounds the measurement error.

Individual standard focus. An examination of individuals' ideal standards of adequacy should include collection of lay opinions (public judgment) as well as opinions of professionals providing that service (expert judgment). It would be important to ask questions such as: (1) How many and what kinds of personnel are needed? (2) What are the technology and other facility needs? (3) What is the best possible location of the service (time-distance factors)? (4) How much should the service cost? (5) What is the ideal service outcome?

Some major problems of measurement which compound the difficulty of developing an index of "adequacy" include: (1) Individual standards will vary from person to person. (2) The individual standard is a value laden judgment. (3) The individual's frame of reference in ascertaining service adequacy is usually not known to the researcher. (i.e. How much does the respondent know about the available service?) Nevertheless, a consideration of individual evaluation of standards of service adequacy should be taken into account if we are to arrive at a multi-variate model which includes the full range of conceptual dimensions.

Individual assessment of adequacy of service. A second aspect of "Public" and "Expert" judgment includes individual assessment of how well the "ideal" standard (described above) is met. In this sense, one might say this dimension of service adequacy measures "relative deprivation", or the adequacy of the service from the individual and

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One suggestion made by a colleague was that the proposed research on adequacy of service should seek to determine the manipulable variables that would facilitate improvement of community services. The success of such an effort, however, is contingent upon first identifying those aspects of the delivery system that require and are amenable to manipulation. Such an effort seems more appropriate as a second phase of the research, or after we have identified and analyzed the variables to be analyzed in establishing the criteria of service adequacy.

expert perspectives. One would therefore need to ask questions corresponding to those utilized in determining the "ideal" public and expert evaluations of adequacy. Problems of measurement would be similar to those encountered in determining the "ideal" standards.

Community standard of adequacy. Reference to a "community standard" implies that within the community population one is able to arrive at relative consensus among community members regarding service adequacy. Obviously, consensus may be high or low depending upon the heterogeneity of the community. Problems of measurement therefore would be similar to those discussed above in regard to individual adequacy standards, but would also include the problem of arriving at a community standard acceptable to all segments of the population. Rather than aggregating the various individual adequacy standards, one should develop a number of separate standards on which consensus is possible for identifiable groups within the community. We would probably find that for one community group one standard is acceptable, whereas for another segment of the community another standard is more appropriate.

Community assessment of "community standard". A final element in the typology would include community assessment of how well the community standard is met. Measurement problems would be similar to those mentioned above, since variation from individual to individual and among different segments of the population will compound determination of "community assessment". The procedure suggested above for arriving at multiple measures of 'standard of adequacy" also seems appropriate in determining community assessment of adequacy.

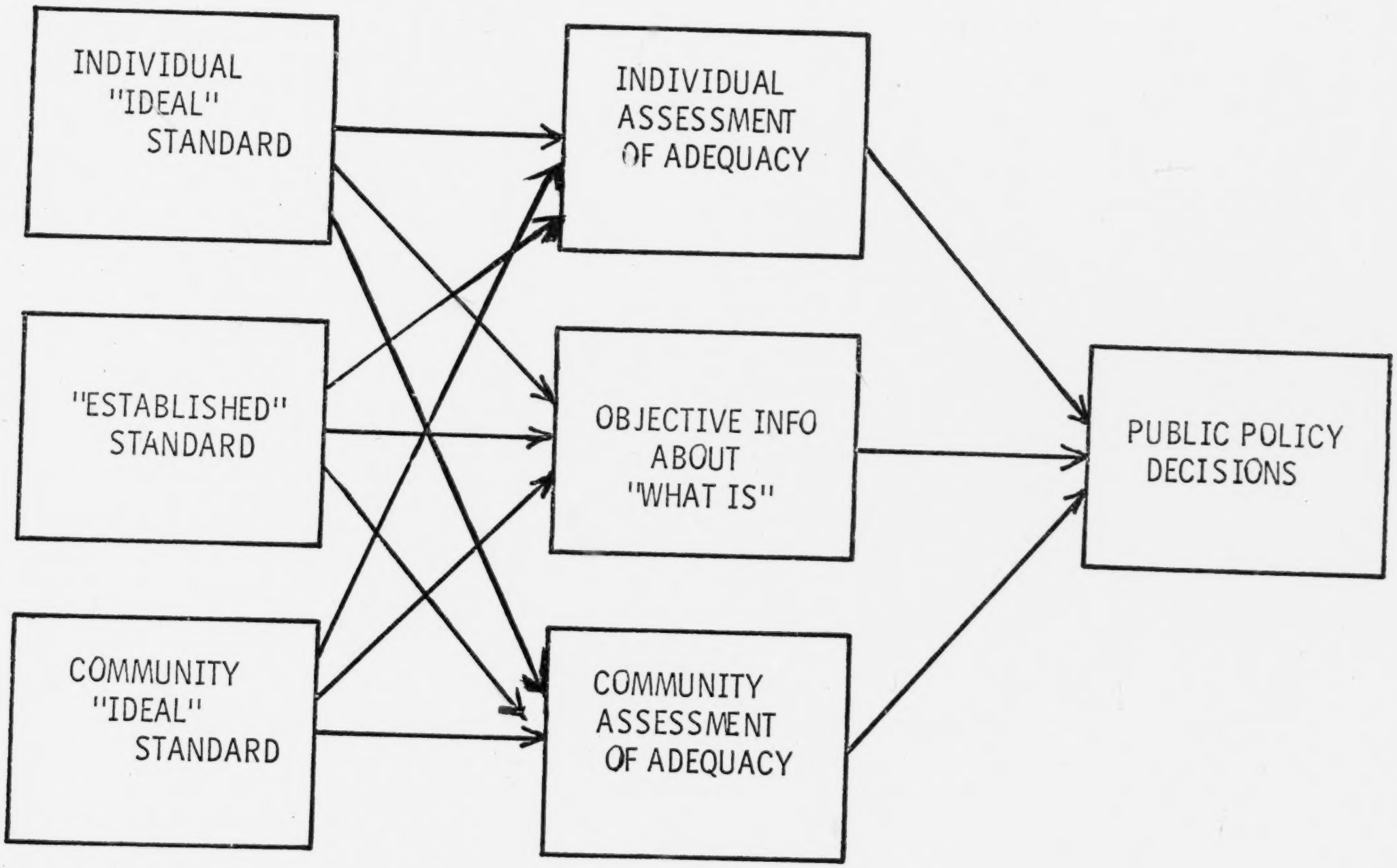
CONCLUSION

These six measurement types could be combined in a variety of ways to analyze the several dimensions of "service adequacy". Judgments regarding the most appropriate or useful measurements should depend on: (1) the difficulties of measurement, and (2) the implications that determination of adequacy will have for policy decisions.

One possible multi-dimensional measure might look something like the attached diagram. Determination of criteria of service adequacy could include selected aspects of the "established", "individual", and "community" perspectives described above. Assessment of adequacy could likewise be a multi-variate measure, including elements of the "existing", "individual", and "community" variables. It might be desirable to look at all the analytic possibilities and discuss the "pros and cons" of each relative to the measurement difficulties and policy implications. In this fashion, loopholes could be identified, and new possibilities for analysis opened up for consideration. It should be abvious, however, that a multi-variate model will be necessary to adequately cover the relevant dimensions involved in any assessment of community service adequacy.

STANDARD

MEASURE OF ADEQUACY



THEORETICAL CONCERNS IN THE MEASUREMENT OF ADEQUACY OF COMMUNITY SERVICES AND HOW TO ASSESS THEM IN THE RURAL AREAS

By Pedro F. Hernandez
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I. Introduction: The topic under consideration is in the theoretical frame of social development. Several Regional Projects, (USDA in cooperation with various Agricultural Experiment Stations in major universities), are concerned with social development, particularly Project S-79.

Objective of this Paper: Our goal here is to present a linkage between the overall concern for the measurement of social development and the particular concern for evaluating the adequacy of community services. From this vantage point we can better understand the assessment of such services, (and their future planning), in terms of an orderly process of community action.

Plan: The thesis to be developed is that "social indicators are one of the major yardsticks of social development: a particular aspect of this development - as well as a major factor of it, is the delivery of community services." The application of this thesis to rural societies does not change the nature of our problem: it only makes it more concrete.

Prepared for the Lincoln, Neb. Meeting of Technical Committies of Regional Research Projects promoted by the USDA, (Ag. Exp. Stations cooperating). Dec. 71.

The consequences of such a thesis can be summarized this way: a. it is necessary to confront the delivery of services against the criteria of development from which the social indicators have been derived. b. Such a confrontation will take the form of a process of action, (social) in which evaluation, community self-criticism and decision-making play very important roles.

Other consequences can be drawn later on behalf of the experiences of Regional Project S-79 related to the development of human resources in rural Southern U.S.

Division: 1. Social Development: theoretical aspects and state of research in terms of empirical studies:

2. Community Services: a tool for development: the case of rural societies;
3. Social Indicators: their relation to development and to developmental tools;
4. The consequential process of evaluation: delivery of community services and particular considerations for the rural South.

II. Social Development: theoretical aspects and state of empirical research.

Many social scientists are of the opinion that the challenge of sociology, as well as its academic growth in years to come, is bound to the problem of developmental change, the problem of planned change in human societies.

Gouldner[1] and Friedrichs,[2] in their two most recent books, already regarded as axial works in contemporary sociology, Piaget[3] and Lazarsfeld,[4] in their evaluation of recent trends of sociology, Rene Koenig[5] and A. Touraine:[6] are only a sample of a vast literature. More particularly, there exist academic trends of research pointing out Rural Sociology as one of the major sociological disciplines concerned with change and development.

Social development is defined as a process of deliberate social change which aims at increasing the chances of fulfillment for societies as well as for their individual members. It is not exclusive, but rather complementary to what economists and other social scientists have been calling 'economic development'.

There are various reasons for a comprehensive view of societal growth as a process of development. First, the term (social development) is now posited as a process which in the life of societies also expresses a part and a relation to a larger evolutionary process or universal movement of life. Second, it does not imply any more a necessary progress a "la Spencer": neither a deterministic outlook of particular theology. Third, it is now recognized that economic activity is a cultural endeavor; therefore economic development belongs to a more complex process of human activity

A part of the theoretical reasons are implicated in what was said above, but there exist others we will briefly

describe. The major one is the need to discover and define the goals, expressed or latent, towards which societies move. The second, to delineate, as much as we can, the structural setting of the societies under study. One must learn from them the origins, their dynamic traits and how they have achieved their goals in the past, (with success or without it).

Another important factor to be taken into consideration is the part which community action and community decision-making has played so far along the history of any particular community. One must never forget that such phenomena may very well exist even in societies which live under paternalistic or dictatorial types of authority.

The state of empirical studies related to social development per se is nothing but incipient in sociology as well as in related disciplines. Its picture is fragmentary and its results still not very satisfactory. This is true in spite of the great steps already taken in the fields of regional and urban planning. Some of the major examples are to be studied, for instance, in the cases of IFERD, (national planning in Colombia, under French auspices), M.I.T. and CENDES in Venezuela, TVA in Southern USA, the Chinese planning of Tanzania, the Le-Corbusier model city in New Delhi, the Lerma project in Mexico, etc.

Most of the time we get the feeling that the overwhelming pressures of population and urbanization together with the new demands of nationalistic pride and economic

self-sufficiency have completed the critical time and have thus compelled the governments and the scholars to act and to plan before assesing the situation and the needs of society. This is more relevant if we estimate the lack of knowledge about societal dynamics and of desired structural changes.

References should now be made to regional projects, as proposed and being implemented by the USDA in the various Agriculture Experiment Stations cooperating. They vary in age, in their particular orientations and the time and personnel employed. Whatever the reasons may be, the fact is that the phenomeon as a whole is still experimental. Nevertheless, the very fact of its setting and the potential of its organization, (together with the resources under command), speaks highly of their future. Especially if regional and local leaders could decisively overcome some partical (and perhaps miopic) considerations of localities and truly apply all the resources available to the regional task.

In view of what has been said about other efforts of social development at national and regional levels, (a part of the USA), the lesson to learn is certainly not to postpone all action until we have all sociological surveys at hand, but to apply ourselves to the work hand to hand with other disciplines, especially with planners and political scientists. Our task should preferably be the one of helping them with sound hypotheses and other

elements of theoretical nature, like surveys of societal goals, aspirations, better definitions of situations and clear delimitations of societal structures which can only be gained through historical analysis and through empirical survey methods.

III. On Community Services

About community services, one can talk both ways: as a circumstance, (an aspect of development) or as part of the content, sustantively, in the sense of one of the major tools for social development. I concentrate here upon the second issue.

It seems clear that all national societies tend to act on the basis of highly concentrated or centralized bureaucracies. Almost all major agencies which provide the bulk of services to our communities, (economic, religious, recreational, sanitational, etc.) are involved in a complex process of decision-making which comprehends many people and many factors well beyond the realm of any locality.

On the other hand, each community possesses also a core of agencies which are conceived and sustained in terms of aspects and needs peculiar to its constituency. Municipal services fell into this category: the size of localities, the nature of economic activities, etc., usually determine the quality and range of these agencies and of their correspondent services. (The second paper deals with their ennumeration and aggregation in terms of our regional

efforts).

Whatever such services may be, it is appropriate for us to realize that their existence, (their selection from the part of the members of any community), their activities, their importance in the minds of the constituents and of the persons who are affected by these services, will manifest a double meaning, (sociologically). First, it will be through such services that a set of national goals, legally defined, will be carried out. Second, it will be through the same services that the community expresses its own particular style of life, the particular interpretation of national standards.

A dialectical process is therefore the expected phenomenon to take place in every community: a certain image of society will be presented and transmitted through the very existence and purpose of the service agencies. Constrasting to it, another image, a sort of "community-self" will emerge expressing the way societies understand themselves and would like to be themselves also.

The application of these thoughts to rural communities gives us a better diagnosis of our problem. Rural communities are in a particular situation concerning the centralized decisions and the community self-expression. They are exposed to decision-making processes many times fully strange to them. Even decisions at municipal or county level are taken without much concern for the people of small towns. In a good many cases, these towns are pro-

vided with services, (from national, state or county bodies) which do not reflect the real demands of the community, but which rather ask the community to accomodate itself to what is available.

In that extent, rural communities appear to have the limitations of isolated life many farmers are going through, without the enjoyment of freedom and the adequacy or sufficiency of services many a farm-family may tailor for itself.

IV. On Social Indicators

It is the contention of this paper that social indicators provide a natural bridge of measurement between social development and the quality of community services. We confidently hope other papers will tackle the problem of the aggregate numbers of indicators and confine ourselves to explore their nature.

Social indicators can be viewed as isolated quantitative expressions of community life, (like, for instance, the median of rooms per household, etc.) or as ordinal steps of a process towards the achievement of goals. The relation of such indicators to social development is therefore of two different kinds: a. in the first instance social indicators are only reflections of a static picture: they tell us nothing about the dynamics of the societal structures, although they can tell us a lot about the state of mind or about some traits of the style of life of a certain society at a specific stage of their evolution.

b. A second relation of the indicators towards social development is their hierarchical position in view of a concrete process of goal attainment. Here the indicators will emerge as true expressions of the dynamics of group life. In both instances one is to keep in mind that social indicators, quantitative, express qualities of life in an indirect manner, as well as the real values societies live with, strive for, encourage, etc.

It has been recognized, (Piaget[7]), that among other characteristics, modern sociology tends to select some variables of any complex picture, (indicators, for instance) and apply to them the most powerful statistical techniques available. This way, sociologists can draw sound conclusions about the nature of causes of social phenomena, given their association with other variables, with certain parameters, etc. The most recent efforts on mathematical modeling, (Coleman,[8] Boule,[9] etc.) and of systems analysis, (Buckley[10]), which are often complementary to each other, represent a logical sequence of that general trend.

It is important to realize, however, that in regard to social indicators and to their specific functions as yardsticks of development, nothing can substitute our careful thinking and our observation of reality, (through surveys, through history, etc.), in order to detect the values which social indicators represent and the the goals towards which societies move by gaining and supporting such values.

V. The Consequential Process of Evaluation

It is in regard to community services that the definition of social indicators, their discovery and expression becomes of crucial importance. Services are among the most obvious tools for development since they are a major part of the community demands and aspirations. Social indicators stem from those demands in view of felt-needs. They also feed-back upon community life and community processes as soon as the satisfaction of needs becomes experienced, (positively or negatively).

In view of this, the task of discovering social indicators is equal to the endeavor of realizing how the dialogue between felt-needs, (of every particular society) and experienced satisfaction occurs. Unless such discovery is made, the indicators will tell us very little or nothing about the structural dynamics of societal growth, (or its development).

The consequence of this reflection is that such a discovery and definition of indicators possibly can be best accomplished, though never with perfection, through the analysis of the processes of decision-making in community actions. The reason is simple: if social indicators emerge out of a dialectic, (or a dialogue between counteracting and complementing parties, here between two major stations of a need-satisfaction process), they may be best detected in other processes which by nature tend to reflect the original one.

In this respect, the survey of leaders, (to gain views from the top), as well as the observation and/or surveys of common people, (to perceive the processes from the bottom), is paramount, especially if one focuses its efforts upon the steps of criticism and evaluation of community actions, within the overall processes of community decision-making.

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RURAL DEVELOPMENT AND THE QUALITY OF LIFE IN THE RURAL SOUTH: CONCEPTS AND INDICATORS IN THE S-79 REGIONAL PROJECT

by

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S-79, "Rural Development and the Quality of Life in the Rural South," was activated February 10, 1971 and grew out of the earlier regional projects, S-44 and S-61. The participants in the current project are rural sociologists and a few agricultural economists in Alabama, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, and Texas.

The regional plan and project outline were prepared and approved in record time and work got underway promptly in most of the states. Several subcommittees have been active in further planning and implementation, and data collection for two phases of the study is well underway. Nevertheless, a number of basic issues of conceptualization, design, and methodology remain to be solved.

In a general way this project fits into the "delivery of services" framework of this workshop, though this terminology has not been used by the Committee. It appears that our project is less closely related to the other three represented in this workshop than are those three to each other, but, still, there is some commonality.

Quality of life is our key concept. I believe the Committee sees this as essentially a subjective evaluation that may be somewhat independent of the objective facts, per se--that is, the same quality of life level as evaluated by the people of communities or areas may represent different mixes and levels of objective indicators. Nevertheless, we see quality of life as being defined by objective and subjective indicators in all of the various institutional areas and aspects of community life, such as population, government, politics, agriculture, industry and employment, health and medical care, welfare, public order and safety, transportation and communication, social and civic organization, religion, recreation and cultural arts, public utilities, and the physical environment. Among the institutional areas, we feel that some priority should probably be given to the economy, education, and health. Moreover, we have identified

some criteria of life quality which cut across the various aspects of life and which we feel should be applied whether or not they are recognized as important by most people in a community. These are reflected in such questions as

> Do all subgroups (ages, occupations, race and ethnic groups, geographic areas) share in community services or "the good life" as it is defined locally?
>
> Is there widespread participation and involvement in community decision-making?
>
> Is there some choice and toleration as to differing life-styles, values, and policy positions in the community?
>
> Is there a substantial commitment to community welfare as opposed to individual prerogative and self-interest, and is chronic major conflict absent?

The unit of study is the <u>county</u>, not the individual. The 30 sample counties in seven states are all non-metropolitan. We are mainly concerned with <u>change</u>, or movement toward a better quality of life during the past decade, rather than with current status or adequacy, per se. And of course we are concerned with the factors associated with types and direction of change.

The study counties are all relatively rural and poor. Most of them were selected as sample counties for S-79's predecessor studies, on the basis of 1950 Census data. Others have been added on the basis of the same criteria, that they were in economic areas classified as having at that time "serious" or "substantial" low-income and low level-of-living problems, and that they had a level of living index below the median for the generalized area of which they were a part. Despite the emphasis on <u>rural</u> development and quality of life, the county will be taken as a unit and any urban areas in the county included in the study. And of course the Committee is aware that the quality of life of a given county is not measured entirely within the county borders but is affected in many ways by conditions of the general area or in specific locations outside the county.

We see the work that has been done in recent years by sociologists and others under the rubric of <u>social indicators</u> as the theoretical and methodological underpinning of our work. Some representative publications are those of Duncan, Gross, Sheldon and Moore, Bauer, and various national commissions! But economists probably have considerably more experience than sociologists with the construction, use and interpretation of indicators of this kind and we solicit advice and assistance based on this experience.

We expect to have the following types of data for each county:

1. 1970 Census, and changes from 1960 and previous periods.
2. Other secondary data available for the decade of the 60s or approximately so--vital statistics, data series on education, income, employment, etc. from state and national government sources, university and association bureaus, etc.
3. Factual data from local sources--facilities and services available, registration and voting, school system data, etc.
4. Opinion and perception data from local officials and "knowledgeables" concerning changes in the county and in each aspect of life.
5. Opinion, perception, and individual status and change data from a cross-section sample of households in each county (and, in some counties, comparable data from a 1961 household survey).
6. Individual "case studies" of samples of households in some counties, 1961 and present.

All of the data will be aggregated in some way to county measures and for the most part the units of analysis will be counties rather than individuals. We do not have at this stage a formal research design with specific hypotheses or methodological strategies, or even a definition of principal dependent and independent variables. Potentially there are several hundred separate indicators, some objective and some subjective. Few of the many variables or indicators to be available seem intrinsically dependent or independent. However, the subjective general assessment of the quality of life and the direction of change in quality of life on the part of people in the county seem likely to be important dependent variables. We probably will have to explore the simple relationships between indicators before deciding on a more sophisticated design.

Some of the issues facing us are the following:

How can we intermix and/or combine subjective and objective indicators?

Within the subjective group, how can we use or possibly combine or weight the evaluations of officials and "knowledgeables" and those of the cross-section sample, especially if they are contradictory?

How shall we create aggregate indicators initially--ratios, county rank, or percentages for a key response?

Should we create combined indicators for each aspect of life, or use individual indicators at first?

Should adequacy assessments and improvement or change perceptions be kept separate or does it make sense to combine them for some purposes?

In moving from simple to combined or more complex indicators, what assumptions or basis for weighting are appropriate?

How can purely qualitative data such as volunteered comments, tone, or interviewers notes be used?

With only 30 cases (counties), what methodology and statistical techniques will have optimal payoff?

We would welcome suggestions and comments on these and other aspects of the study.

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[1]See Bauer, R. A., Social Indicators, M.I.T. Press, 1968; Duncan, O. Dudley, Toward Social Reporting, Russell Sage, 1969; Gross, B., Social Intelligence for America's Future; Sheldon, E. B., and W. E. Moore, Indicators of Social Change, Russell Sage, 1968; and U.S. Department of Health, Education and Welfare, Toward a Social Report, 1969.

SOME METHODOLOGICAL CONSIDERATIONS FOR RURAL COMMUNITY SERVICES RESEARCH

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INTRODUCTION

In December of last year (1970), 3 sociologists and 2 economists met in Tucson, Arizona, to draft a regional research project proposal concerning the provision of community services to rural areas. As we negotiated the finer points of the proposal, I seemed to sense satisfaction among my colleagues with respect to the "researchability" of our proposal. In fact, we reassured one another that once we discovered a handy measure of adequacy of community services, the remainder of the project could be completed using very traditional socio-economic analytical techniques. One of the sociologists, upon returning to his home base, quickly recognized the complexities of the monster he had helped create and elected to join a regional project dealing with rural employment opportunities. The remainder of the W-114 architectural team has come here seeking assistance in how to do what once--only a year ago in Tucson--appeared so simple. Most of us have since discovered that the development of a generalized analytical framework for multiple community services will require "plowing some new ground". I have a sneaking suspicion this may have been a primary stimulus for this national workshop on problems of research on the delivery of community services in rural areas.

As a representative of W-114 I view my assignment this morning to include:

(1) a brief overview of our regional project, couched primarily in terms of the major elements in the research design with some reference on how we hope to arrive at a policy evaluation technique, and
(2) some comments on alternative conceptional framework.

OVERVIEW OF W-114

W-114 is entitled "Institutional Structures for Improving Rural Community Services." From the stated objectives of the project, the work needed to analyze any one community service is outlined in Figure 1. An important intermediate goal involves evaluation of the relationships between adequacy of the community service in question and community socio-economic characteristics plus attributes of the organization providing the service.

The dependent variable--adequacy of service--was discussed in some detail earlier in this workshop. I would like to comment briefly on what we think represent major classes of independent variables. Organizational characteristics, such as level of revenue, sources of revenue, public or private support, size and training of staff and a host of similar organizational attributes were hypothesized to influence adequacy of community services. Community socio-economic characteristics are depicted in the figure as circles--primarily to indicate that these variables are more likely to be autonomous and thus not as subject to manipulation in our later analysis. We have hypothesized population characteristics such as size, density, age distribution, existence of ethnic minorities; community economic

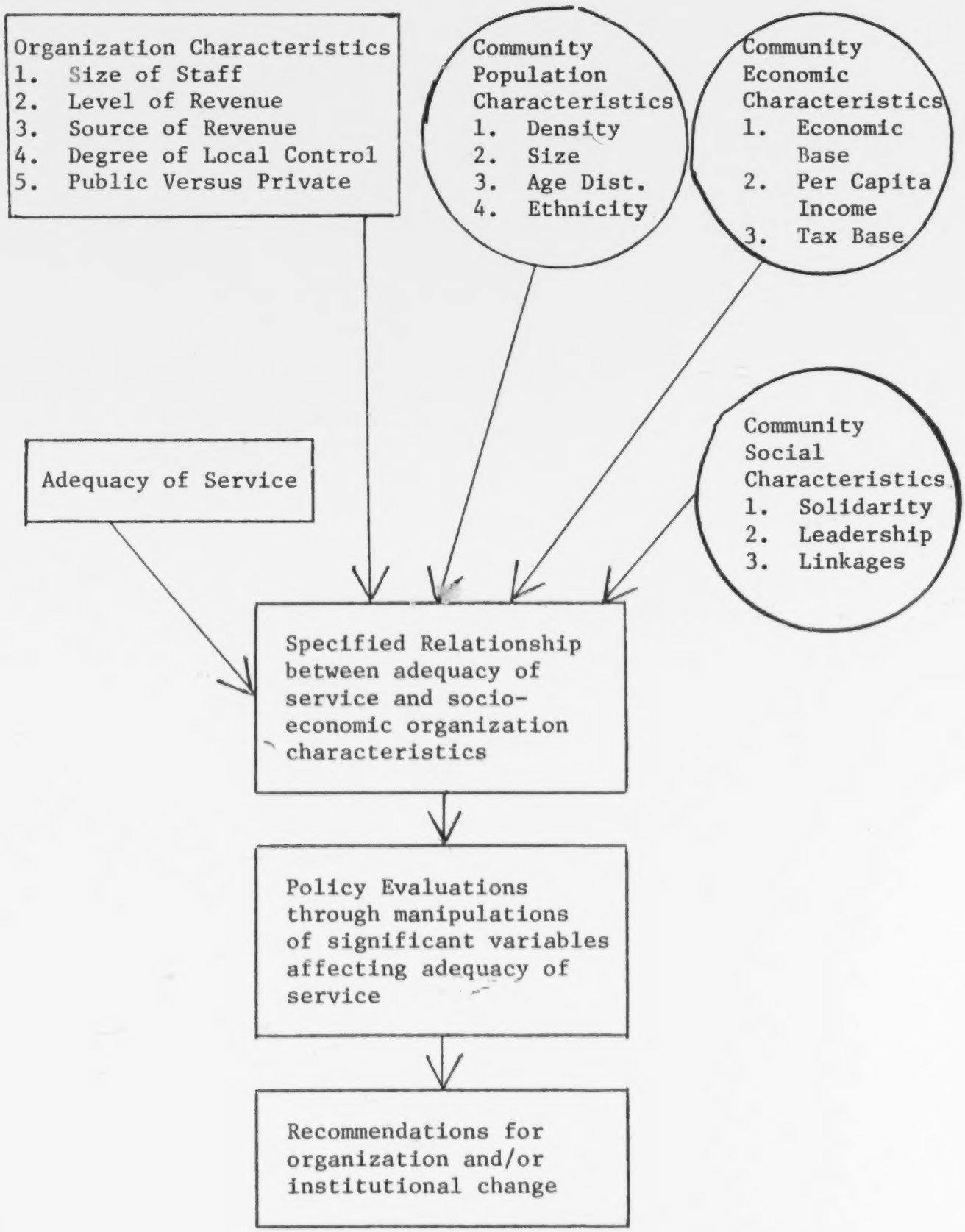

Figure 1. Western Regional Research Project 114, "Institutional Structures for Improving Rural Community Services."

characteristics such as the nature of the economic base, level of employment, per capita income, tax base; and community social forces such as the degree of solidarity, the size of the leadership pool, and linkages influence the existence and adequacy of rural community services.

If we are successful in discovering relationships between adequacy of service and these independent variables (i.e., if we can explain adequacy of service) then we can use this information to evaluate policies or strategies to enhance the quality of rural community services. A last step in our research effort would be the presentation of recommendations on how institutions and/or organizations might be altered to improve adequacy of services. A different kind of outcome could also result. For example, solidarity, one of the socio-economic variables, may significantly affect adequacy of community services. Improvement in community services may instead follow from increased community focus, interest, and participation rather than manipulation of institutional structures.

Figure 1 is highly simplified and should not suggest that the W-114 committee has settled all procedural questions. (For example, a more complete treatise might show the causal ordering of variables.) We are, during these sessions at Lincoln, hearing 3 sub-committee reports on the following questions:

1. how to measure adequacy of community services
2. what variables should be considered in describing an organization, and
3. what is the basic unit of analysis when investigating community services?

In attempting to answer the question on unit of analysis, the research team at New Mexico State University--supported by members of W-114--has recognized at least 2 possible conceptual frameworks for dealing with multiple community services. The remainder of my report this morning, dealing with these two frameworks, does not necessarily have the blessings of W-114, but was commissioned by this august body.

POINT OF EMANATION

An obvious approach to the unit of analysis question views community services from the point of emanation. Because the clientele for most services are spatially dispersed, this view requires definition of a "market" or "service" area around the point of emanation. For example, the service area for the county sheriff's department would be the county, the service area for school district #31 would be school district #31, and the city library would have a service area delineated, perhaps, by the city boundaries. For some community services, such as hospitals, it might be necessary to resort to other means of delineating "service" areas. One possibility would be the central place definition in terms of inner and outer ranges of the service. At any rate, the unit of analysis--if services are viewed from the point of emanation--would probably be the "service" area delineated.

How would this fit in with the proposition outlined in Figure 1? Adequacy of services could possibly be defined over a geographic area; in fact, this project concerns the delivery of community services to rural areas. We could easily add another dimension to organizational characteristics--that of size of "service" area and subsequently hypothesize that adequacy of the service provided is also somehow related to the size of the service area.[1] The community characteristics in this case, do not influence our selection of a unit of analysis.

A number of problems pop up, however, if you view this research from the point of emanation-service area concept. In sparsely settled areas, such as our study area in Northcentral New Mexico, very few centers of service actually exist. Thus, when we try to relate institutional characteristics to the community services we will be thrown into a situation of having extremely scant data from which to work. This means that we could advance both many possible explanations for the actual situation and many suggested remedies, without having any chance of analytically investigating which explanations might be the better. To frame it another way, our sample size can be no larger than our population size; sample size cannot exceed the number of centers of services.

A second problem lies in the actual philosophy; what is the object of interest, the institution rendering the service or the people who need service? We advance this assertion: if we want to improve the lives of people, we should examine the people as they are and as they fail to get services in order to find out how to change their situation. Thus, an orientation toward origin of need would allow a more direct examination of the central issue.

Another problem involves substantial variation in overlapping service areas for different services. For example, some services such as fire protection, police protection, education, sanitation,

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1 The point of emanation-service area concept might best be summarized in the following equation:

$$A_{ij} = F_1 \text{ (Community Population Density, Population, Age Distribution, Ethnicity)} + F_2 \text{ (Community Economic Base, Per Capita Income, Tax Base)} + F_3 \text{ (Community Solidarity, Leadership, Linkages)} + F_4 \text{ (Organization Size of Staff, Source of Revenue, Degree of Local Control, Public VS. Private, Size of Market Area)}$$

Where A = Adequacy of Services
i = Community Service
j = Service Area (School District, County, or City)

and welfare agencies have reasonably well defined geographical boundaries of responsibility, but the boundaries do not correspond from one service to another. Yet, we want to relate the adequacy of various services to the same community characteristics. This becomes even more troublesome when we recognize that some services emanate from one point to a large area while for other services, many smaller service areas exist.

Finally, we recognize a limitation of reality in the point of emanation-service area concept. The clientele of a particular center from which a service emanates is not well defined. From any particular hamlet people frequently go several places to receive the same service. This is not consistent with our proposition of service centers with implied exclusive market or service areas. Practically, we need to examine how institutional characteristics tend to influence people's selection of centers for service as opposed to an alternative. These problems lead us to consider an alternative conceptualization, the point of utilization.

POINT OF UTILIZATION

The point of emanation approach focuses on services from the suppliers' perspective; in this section the focus is shifted to community service from the standpoint of the consumer or intended recipient. This framework for examining how service needs are satisfied looks directly at the need itself, at the point from which it arises, and relates other things to occurrences at the level of origin of need.

Needs arise where the people live. Thus, define an origin of need as being a small region consisting of people operating under similar constraints of time, space and socio-economic characteristics. An origin of need in a metropolitan area could be a fairly small area consisting of several city blocks. In a totally rural area it would cover a large area, but have fairly similar characteristics for agriculture or other important identifying features. An origin of need could be of any reasonable size. In a sense, an origin of need could be an individual person or household, but practically, we can restrict attention to slightly larger areas involving a number of people with similar characteristics. For the study area in Northcentral New Mexico, we plan to look at the small hamlets in the countryside and at neighborhoods in the larger metropolitan areas to see how the institutions impinge on these origins of need. In the jargon of most disciplines represented here, we have shifted from a macro to a micro orientation.

The need for services involves two components, the services themselves, and the minimal levels below which each service is being improperly rendered. For the purposes of the remaining discussion consider any particular service with the intention of applying a parallel approach in each service. Henceforth, we will speak of the service of interest using medical needs to provide continuing

illustration. The real medical needs of a group of people at any particular origin of need depends upon their age, health, and related characteristics, but not on their wealth, culture, or such other things. Thus, people's needs depend on their characteristics themselves, not on where they live. For example, it seems reasonable to expect that a group of people of certain age structure and health composition would have discernable average minimum need for hospitalization. Each service certainly will have different levels of need, but some minimal level exists for each service regardless of its availability.

Utilization describes a different concept. A need exists, but is it satisfied? Utilization, by describing the actual needs satisfied, depends dramatically upon the accessability of the service to the origin of need. The distance from the origin of need to the point(s) from which the associated service emanates definitely will influence its utilization. Likewise, other important influences involve the institutional characteristics of the community in which the service is rendered, transportation and communication systems, etc.

The deficit relative to a particular service can be defined as the aggregate need for that service at the origin of need less the realized utilization from that same origin. The real task requires relating this deficit to various community and institutional characteristics.[2]

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2 The point of utilization concept may be generalized as follows:

$$U_{ik} - N_{ik} = F_1 \quad \text{(Household Income, Occupation, Ages, Number of Children, Etc.)}$$

$$+ F_2 \quad \text{(Center 1 Size of Staff, Source of Income, Degree of Local Control, Public VS. Private, Distance From HH to Center 1)}$$

$$+ F_3 \quad \text{(Center 2 Characteristics, Distance From HH to Center 2)}$$

$$+ F_4 \quad \text{(Characteristics of Sub-Community)}$$

Where U = Utilization
N = Need
i = Community Service
k = Household

The study area in Northcentral New Mexico presents certain difficulties which contributed to development of the above framework. Because the area has a small and dispersed population, we found some initial frustration in defining various components of the above framework.

We take the origin of need as being definable by enumeration districts used by the Bureau of Census during the 1970 census. According to available information these consist of approximately 1,000 people each, although rather substantial variation away from this standard value has been observed in our work. The enumeration districts present in Northcentral New Mexico seem reasonable in light of the area and problem that we are trying to tackle. They consist of contiguous pieces of countryside, usually involving people of similar socio-economic characteristics. Specifically, they appear logically organized around the small hamlets and concentrations of people along watercourses. In the very sparsely populated areas away from the streams, they consist of large areas of countryside, but again, information available suggests that they represent a rationale partition of the area.

Evaluating the needs for services, perhaps poses the greatest difficulties in implementing our ideas set forth here. Currently, we plan to consider need relative to minimum national norms established by various responsible groups. For example, the professional dentistry organization can provide us with an idea of the minimum dental care a person should get in order to satisfactorily care for his teeth. We expect similarly to obtain related needs in various medical areas. These national norms and similar ones will provide us with a means of looking at characteristics of community services such as medical services, educational services, and possibly law enforcement. Certain needs will probably have to be defined somewhat arbitrarily, for example, what level of availability of police services should we really have?

For utilization, we can go two ways depending upon the nature of the service. For services rendered through several well-defined centers, such as hospitals, we can go to the centers rendering the service, sample the records, identify the records by origins of need and thereby establish the actual level of utilization from each origin of need to several competing centers. For certain other services we expect to be able to establish utilization from other considerations about or available from the point or points of their emanation. Utilization of police or law enforcement and fire protection can be obtained from records at the sherrif's office, fire house, or similar places. Other services require going directly to the people. The availability of public health services of the sort available from a public health nurse, concerns to some extent, how much the people think they need the service. For these sorts of services we will

probably have to draw samples of household from each origin of interest and seek to establish the need for such services directly from the center of need.

The deficits of need will be simple to evaluate once the center of need has been defined, the need delineated and the utilization evaluated. The task then comes to relating this deficit to various institutional characteristics associated with the origin of the services. We will include not only characteristics of the institution rendering the service, but also various socio-economic characteristics over a broader area in which the origin of need exists.

Certain responses may be approachable from a slightly different perspective through the use of proxies. When the actual need for a community service cannot be established certain proxies for its utilization or perhaps more precisely, for its lack of availability, may work. Consider, for example, the case of fire protection. Fire insurance rates have a certain rationality in how they are set; these may serve as a good proxy for the availability of fire protection. In such cases, we will study the proxies directly rather than try to evaluate the deficit. In those cases where proxies are selected, they will be analyzed and examined relative to institutional characteristics in the same way as the deficits will be.

SUMMARY

Research on delivery of community services in rural areas will require "plowing some new ground". W-114 committee has articulated three major procedural questions: how do you measure adequacy of community services, what variables describe an organization, and what is a basic unit of analysis for community services? With reference, particularly to the last question, we have outlined two alternative conceptual frameworks, (1) the point of emanation and (2) the point of utilization. The point of utilization concept appears to be the more manageable research framework. It is also most consistent with our desire to evaluate the real object of interest--the rural consumer of community services.

Organization of Public Service Delivery Systems for Rural Areas: Concepts and Measures*

by

Lonnie L. Jones**

Solutions to problems in the organization of service delivery systems for rural areas require the use of concepts and measures from numerous scientific disciplines. Relevant concepts from sociology, political science, and other disciplines must be brought to bear on these problems. Within this broad framework, economic concepts and measures have a unique contribution to make. And, as an economist, my preoccupation here is with economic concepts and measures such as efficiency of resource use, equity, production and other economic concepts central to the supply of and demand for rural public services. I recognize that the inputs from other disciplines are highly relevant, but discussion of these is probably best left to the professionals of those disciplines.

The central theme of this paper is that the basic economic concepts and many of the measures utilized by economists in analyzing the organization and operation of firms in the private sector can also be applied to problems in the organization and provision of public services for rural areas.

If our purpose is to provide desired public services to rural areas as efficiently as possible, then the study of how to supply such services for rural areas is a logical area of inquiry for economists to apply their theoretical concepts and analytical tools. There are important economic issues in the organization of service delivery systems that are very close in concept to the kinds of problems that are traditional for economists.

It may be well to remind ourselves that economics is defined as the science of allocating scare means among competing ends to satisfy those ends as fully as possible. Further, Eidman and Walker [2] remind us that the delivery of each rural public service is a resource using activity whose objective is to satisfy wants and enhance consumer welfare. Hence, there is little basic, conceptual difference from the economic decision framework relevant to the production of private goods and services, although our attention must turn from the

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firm to the community, county or rural area as the relevant decision-making unit. The central economic issue is quite similar - how may limited resources be organized and allocated to accomplish the community's goal or goals. Ultimately, these community goals are to improve utility or welfare. Immediate goals may be to improve the quality and availability of community services, increase income or more jobs. Hence, implied in this discussion is a direct link between these immediate ends of better services and ultimate goals of increased utility.[1] While there is a direct link between better public services and welfare, secondary effects of increased business investment, growth and development as a result of the efficient provision of community services are also important considerations.

It has been stated elsewhere that there are three major considerations in the efficient provision of community services [6]. These are: (1) an analysis of the supply and demand conditions for services in a dynamic rural economy, (2) projection of economic factors influencing supply and demand conditions for rural services and (3) physical planning for rural services to efficiently meet projected demand with restricted and efficient resource use. Each of these areas provide a challenge for economists to apply their concepts and tools.

Demand for Rural Public Services

The analysis and projection of the demand for services in rural areas are essential elements in the organization of delivery systems. Since the construction of service facilities such as schools, hospitals, water and sewage systems, etc., requires significant fixed, capital investments, it is critical that future as well as current needs and demand be taken into account in planning and organizing these systems. The demand for services within a rural area may be expressed as a function of the area's population, location, income and other characteristics and the cost of the service to consumers.

Traditionally, future use of a service has been projected by utilizing population projections in conjunction with current per capita use rate estimates. This method actually yields a projection of future requirements that will materialize only if the current use rate of the service does not change. We need to replace the projection of service requirements at current use rates with projection of actual demand for the service. Current service use rates represent only a single point (at existing prices) on the consumer demand schedule for a service. For those services that may be price responsive, such as public transportation and medical services, the entire consumer demand schedule needs to be considered in projecting future aggregate demand. For instance, if the provision of a service is possible only at a higher price to consumers and if the demand for the service is price

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[1] It may be argued the link between these lower-order ends such as better services and community utility is no more obscure than that between increasing farmer's profit and his utility [8].

responsive, projected requirements using current use rates may exceed demand and overinvestment with respect to the efficient use of resources may be the result.

The use of some other public services such as schools, where use is required by law, is unresponsive to price change. In these cases, simple population projections will likely be sufficiently accurate for planning purposes. However, even for services that are unresponsive to price change, shifts in per capita demand may occur such that projections become inadequate. In some cases, these shifts may be quite abrupt. For example, the creation of federal assistance for medical services for the aged and others shifted the demand for medical services and facilities upward sharply. Since assistance was provided specifically for medical services, this shift was probably greater than would have resulted from a comparable increase in per capita income. Other factors such as new regulations that limit pollution or establish minimums for water quality also have the effect of changing the per capita demand for certain services. All such changes compound the problem of projecting service demand. Economic concepts of collective demand and consumer surplus are applicable and for some services traditional utility concepts may be applied. But, we will probably need to turn to non-static planning techniques in some cases.

One approach would be to accept legal service minimums as a measure of need or demand. On the other hand, development enthusiasts for a community are likely to want to "think big" in planning for services sufficient to stimulate growth [2]. The choice may be situation specific. The "think big" approach can lead to overinvestment unless the area does in fact experience substantial population increase. Underinvestment may be just as serious in other instances. What is needed is a complete analysis and projection of underlying economic and social factors of the area to determine its likelihood of growth or decline and consequent future demand for public services. Input-output and economic growth models may be relevant to this analysis. Recent economic-ecologic models will prove useful in projecting the demand for some services.

Estimation of Production and Cost Functions

Agricultural economists who are accustomed to estimating production and cost functions for crops and farm firms, will readily recognize the need for and usefulness of these concepts in organizing service delivery systems in rural areas. However, the transfer from private firm to community problems and the application of input-output relationships to the provision of rural public services presents some significant methodological and measurement problems. We are familiar with measuring output of farms in easily quantifiable units such as bushels or bales. Measurement problems increase in complexity when we turn to public services. What is the relevant output measure for a school? a hospital? or, a refuse collection system? The difficulty arises in specifying quality dimensions and in incorporating these into the estimation procedure so that both quality and quantity are

reflected in output levels resulting from alternative input combinations. We should, of course, recall that the question of quality has never been fully resolved even in farm firm production and cost functions. Instead, it is assumed (conveniently) that the variance of quality around a specific output-input combination is insignificant. We do not enjoy this convenience for many of the services under consideration, and measurement of quantity and quality of output is probably the single most important obstacle to the general application of production economics concepts.

Some public services and possible measures of their output are presented in Table 1. These are borrowed from Eidman and Walker [2] and are presented here as suggestions for further development. For some services, such as water treatment and refuse collection, the quality dimension of output does not appear difficult to overcome. In others, however, such as hospital services, adequate measures are yet to be developed. The use of "number of beds per 1000 population" is clearly insufficient as a measure of quality of hospital services.

The difficulties of measuring both quantity and quality of output will need to be overcome in the development of cost-effectiveness evaluation of service delivery systems. Some of the measures presented in Table 1 have been used in previous studies with apparent success [9]. While further refinement is needed, the problem may not be much more difficult than that for some agricultural production and cost functions.

Production functions

Hirsch [4] suggests that public service production functions may be specified as follows:

$$\text{output} = f(Q, I, S, T)$$

where:

Q = quality factors of the service
I = input factors
S = service conditions affecting input requirements
and T = state of technology

Input factors for the equation could be disaggregated, at least, into labor and capital inputs, and further disaggregation would likely be desirable. Service conditions include numerous demographic, socio-economic, physical, financial, political and institutional factors related to the ease of providing a given quantity and quality of service. Alternative technological methods used in the system design would be important in some studies. The inclusion of quality variables (Q) on the right-hand side of the estimating equation allows quality variation in the dependent variables to be separated out.

Cost functions

Microeconomic cost concepts as used in agricultural firm analysis are also applicable to the provision of public services. Given the public service system production function, such as that specified by

Table 1. Some Public Services and Possible Measures of Their Output

Type of Service	Output Measure	Possible Output Quality Measures
Water Treatment and Distribution	Cubic Foot or Acre Foot Delivered	Physical & Biological Properties; Uniformity of Water Pressure; Speed of Repair Service
Refuse Collection	Ton, Cubic Yard or Container	Collection Frequency; Pickup Location
Police Protection	City Block or Square Mile Protected	Crime Rate Index
Fire Protection	City Block, Square Mile or Number of Homes Protected	Response Time: Average Annual Fire Loss per $1,000 of Assessed Value
Hospital Services	Patient Days in Hospital	Number of Beds per 1,000 Population
Schools	Average Daily Attendance	Average Achievement Test Scores; Absenteeism; Drop-out Rate
Libraries	Number of Persons Served	Selection of Books; Availability of Books; Reading Room Facilities; Reference Service, and Location

Source: Vernon Eidman and Odell Walker, "The Role of Production Economists in Rural Development Research," Journal Article _____ of the Agricultural Experiment Station, Oklahoma State University, Stillwater, November, 1971.

Hirsch, the average unit cost function for the service system can be estimated. Or, cost functions may be estimated directly. The unit cost of a given service will be affected by the quantity and quality of the service, prices of inputs, and technology. Given an objective of minimizing costs of a specific quality and quantity of public service, we must be careful to include private as well as public or agency costs in our functions. Transportation costs and commuting time are examples of private costs that may vary with alternative service systems. These need to be estimated and included in the analysis to avoid cost shifting from the public to the private sector without reducing overall social costs.

Relationships among services also need to be considered in estimating cost functions. Both complimentary and substitution relationships exist among services, and when considering a set of services local decision makers are faced with a variety of factor-factor, product-product and factor-product relations. For example, public funds expended for schools reduce the amount available for hospitals. But on the other hand, more recreational and cultural services and facilities may reduce the cost of police protection and improved water systems may cut the need for some medical services. These are not unlike relationships encountered in economic analysis of farm firms.

Economies of size

The estimation of cost functions for a given public service immediately and logically leads to the question of economies of size in providing the service for a large rural area. This involves estimating annual average costs for alternative facility and service systems with varying output levels. For example, we are concerned in East Texas with the economies associated with a multi-county solid waste management system. A comparison of short-run average costs for varying sizes of areas served (or tons managed) will provide estimates of economies of size in providing the service. This concept is equally applicable to other public services and it has been applied with success in previous studies [3,5]. Again, it is critical in such an analysis that the quality of service be considered and that private costs be included in the cost functions. Moreover, the need for interdisciplinary collaboration will likely become critical here since increasing the population served by a service system will likely necessitate cooperation among several communities and local governmental units.

Optimum service levels and combinations

The application of operations research techniques such as linear programming, dynamic programming and simulation is a logical extension of production and cost function concepts in organizing rural service systems. Conceptually, such models may be applied to select the optimum level and combination of services for a community or area. One envisions, for example, specifying a linear programming model with the objective of determining the least cost combination and levels of a

set of public services subject to constrainst on the minimum level of each service desired. While such models are conceptually sound, measures and data for assigning the necessary weights, such as relative values of alternative services to the community are yet to be developed. Such models do, however, hold immediate promise for certain suboptimization schemes for a specific service. For instance, separable linear programming has been used in Oklahoma to determine the least cost combination of school size and internal schooling organization for areas of alternative student densities [9].

Network analysis, transportation and plant location models appear to be well suited to certain service system problems such as determining the least cost location for specific service plants and facilities.

Data sources and estimation techniques

Problems of adequate data will likely continue to plague all social scientists in dealing with problems of delivering rural services. The economist's experience with the use of economic engineering data, proxy variables and record data will be helpful. But, we need to identify and tap data sources available from our newly acquired clientele such as state agencies, professional experts, insurance companies and other sources. In Texas, at least, considerable data on services exist from varied sources and we are attempting to assimilate and evaluate this information before launching into the collection of massive amounts of primary data.

Numerous estimation procedures are available for use in problems of providing rural services and, with continued growth in computer software, more may be expected. But, economists have relied chiefly on economic engineering and least squares estimation procedures in the past, and these probably will continue to be popular estimation techniques in rural public service research.

Summary and Conclusions

Most agricultural economists have devoted most of their research time in the past to problems in commercial agriculture. But, the economic concepts utilized in this research are not limited to farm firms or private industries. Concepts of economics may also be applied effectively to problems of efficient resource use in organizing and providing rural service systems. Major considerations include (1) analysis and projection of factors influencing supply and demand for rural services and (2) physical planning for rural services to efficiently meet projected demand with limited resources.

Economic concepts of demand constitute an essential element in planning and organizing rural public service systems. The demand for services can be related to consumer costs and population characteristics of a specific area. The influence of price as a device for allocating resources needs to receive more attention than has been the

case in the past. Autonomous changes in the broader social and political arenas of the state and nation affect the precision with which the demand for services in a region may be projected. It is essential that an accurate analysis be made of an area's potential for growth or decline for purposes of planning for future as well as current public service needs.

Basic economic concepts involved in the estimation of production and cost functions, economies of size and optimum service levels and combinations are also important areas of inquiry. Measures of output and quality of output present significant problems for some services. Nevertheless, the concepts have been applied with success in a number of previous studies and their potential for contribution seems to be rather high.

The economic concepts and measures discussed in this paper by no means constitute an exhaustive array of those relevant to the organization of rural public service systems. Others are important and new concepts and measures may well be required.

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Some Relevant Concerns and Issues in Research On Personal Health Delivery Systems with Special Emphasis on Nonmetropolitan Areas*

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Introduction

The purpose of this paper is to outline some research problems and opportunities in human service delivery systems, with special emphasis on nonmetropolitan areas. Since most of my experience and interest lie in the health field, I will tend to discuss research issues mostly from the standpoint of general health delivery systems. To this extent, the paper is biased. However, I will attempt to point out implications for general service delivery systems at various points as they arise.

My presentation will also be biased to the extent that it reflects my opinion of what priorities exist by way of needed research on community services and health services in particular.

I want to express my thanks to those members of NE-77 who responded to an outline of my proposed paper, which I had sent them earlier in the fall. Some responded in great length, others in a much briefer fashion. All comments had some degree of merit and I will explicitly mention some of them later in particular sections of the paper. Of course, I may have misinterpreted them. If I have, I apologize to both them and you.

Framework for Viewing Community Services

As I see it, the delivery of community services involves, at the most elementary level, three major structural components and two major processes. The three major structural components are: community of context, the provider, and the consumer. The community of context serves as the political, social, economic, demographic and ecological environment within which the provider-consumer relationships take place. The community of context exists at several levels. Each has numerous elements which condition the delivery process. At the broadest level, there are federal laws, certain beliefs and traditions, and special traditional forms of economic and social organization in American society.[1] Below this federal or societal level there are the many regional and state variations and finally intra-state regional, county and local community variations.

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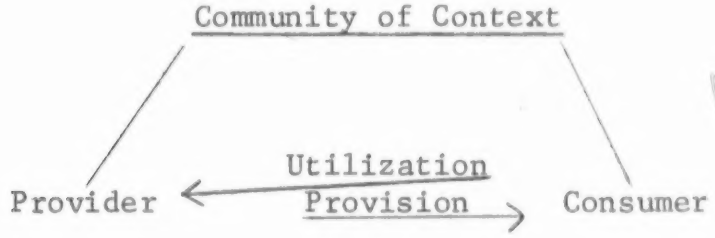
The provider component of the triad is found in many organizational forms involving many facilities. In the area of health we find hospitals, private practitioners, nursing homes, rehabilitation centers and mental health centers to name but a few.

The consumer ultimately is the individual. However, there are often intermediate or third parties who represent the consumers and enter in negotiation and payment for service. Labor unions, group insurance, and public welfare agencies are three typical examples of third party intermediaries.

The interaction between provider and consumer falls under the two broad processes of provision and utilization.[2] Provision is defined as those steps taken by the provider to deliver a service to some consumer or groups of consumers. Utilization is the general process by which consumers acquire the service offered by the provider.

All of the above five elements of community service delivery can be diagrammed as follows:



The purpose of this paper is to unfold the above triad and point to areas needing research. As indicated earlier, these priorities will reflect my opinions and interests in health delivery systems.

Priority Problem Areas and Their Multidisciplinary Nature

To begin to unfold the above scheme on community service delivery, it seemed helpful to outline some of the priority areas which I deem appropriate. Lou Ploch of Maine and Tom Hady of ERS both reacted to my earlier outline by noting that I had a rather long listing of potential research areas but that I should set some priorities.[3] Upon further review and attempts to write, I agreed. I did not feel like, and I'm sure you would not tolerate, my speaking the remainder of the day.

Two approaches could be taken when attempting to set priority needs for research in human service delivery systems. On the one hand, one could discuss high priority program problems which need research, and then proceed to outline research needed within each of these high priority program areas. A program area is conceived as a field of operations within health such as organization for delivery. A second approach is to consider high priority research problems, where the emphasis is on research problems with no particular reference to high priority program problem areas.

After wrestling with this problem somewhat, it appeared to me that it would be much more useful to place the emphasis first on priority health problem areas, and then delineate within each of these, the priority research questions as I see them. I judged that this approach also enables a more ready transfer for those colleagues interested in research on other community services such as welfare, housing, and education.

Priority Problems

There appear to be three major priority problem areas in the health field. These are organization, manpower and financing.[4] These three areas are concerned with the provision side of the provider-consumer relationship. A fourth and slightly lower priority area includes the many facets of the problem of utilization. Although utilization does not occur in the literature as much as the three preceding topics, I deem it to be almost as important as the other three. I considered facilities as a fifth area, but ruled it out on two grounds.[5] One was that facilities are closely tied to organizational aspects. And secondly, it seems that the major problems in health today are those of "software" rather than those of "hardware."[6]

Since we represent several disciplines here at the workshop, and since delivery of service is a societal problem to be solved with the acumen, knowledge and skills of multiple disciplines, I thought it might provide further background to the unfolding process if we consider for a few moments, the relationship between the four problem areas I just mentioned, and some of the more relevant disciplines.

In comparing the four problems with several relevant disciplines, we come up with a chart as follows:

	Priority Problem Areas			
Discipline	Organization	Financing	Manpower	Utilization
Anthropology				A
Economics		B		
Geography				
Political Science	C			
Psychology				
Sociology	D			

Of course, the many health professions must also be considered an integral part of the problem solution.

The letters in the above chart were placed in the several cells so as to provide some concrete illustrations. In the area of utilization (Cell A), for example, it is well recognized that beliefs, values, and other elements of a society or community's culture regarding health, pain, need and modes of treatment figure importantly in utilization of services.[7] The study of culture per se is the primary domain of anthropologists.

The work of economists in the health field is probably most directly concerned with financing and costing health services.[8] (Cell B) However, economists also deal with demand models in the area of manpower and services, as well as concepts of scale, and techniques of linear programming in location of community health services. Problems of productivity and the impact of health services on the economy are other foci.

In organizing health services, and in financing them, many questions of a political nature continue to surface.[9] (Cell C) Should a county opt for its own health department, or let state agencies provide services?[10] What are the power plays and relative strengths of county commissioners, medical societies and state agencies? Which legislators will agree to state assistance for county health departments and which will not? The current national debate about health insurance is immensely concerned with politics.

The main thrust of sociologists is perhaps in the area of organization, focusing on inter-organizational relationships, intra-organizational analyses of goals, division of labor and other problems. (Cell D) Other sociologists have studied various facets of manpower problems. Social-psychological factors also figure into the problem of utilization. Community relationships, structures and processes as related to health also are an important part of the sociologist's domain.

Admittedly there are overlaps in the above illustrations. All of the disciplines probably get involved in some degree in all four problem areas. Nevertheless, the illustrations serve to point up the fact that any solution to health problems requires the input of numerous disciplines.

Previous Reports on Research Priorities

In 1966, the U.S. Public Health Service convened a conference to discuss research priorities in various aspects of health. The results of this conference were published in two parts on the October 1966 issue of the Milbank Memorial Fund Quarterly. I have attempted to draw upon and build upon the articles in these two reports (Health Services Research I and II) and incorporate ideas, proposals, and concepts which have emerged since their publication. Nearly all of the articles in this series are referenced in the present paper.

Research Priorities in Organization

As I have indicated, I believe the major problems in health services today are problems of software rather than hardware. I deem organization to be of a "software" nature.

We can deal with the question of organization at various levels--societal, regional, state, local. The level of primary concern in this paper will be the local community for as Blum asserts, the bulk of health care is delivered at the local level. (Blum:53)

There is much agreement that whether we speak of the national, state or local picture, the health "system" is in actuality a health "non-system." (Allan, 1971:82-83; Hildreth, 1971:4; Anderson, 1968:64; and Somers, 1970:168) We have many parts or subsystems, but they are clearly far from well integrated or completely coordinated. The assortment of health delivery systems can be examined along several dimensions; sponsorship, function and stage of illness. In terms of sponsorship there are public, private profit, private nonprofit, and voluntary organizations providing health services. From a function standpoint, we would include hospitals, neighborhood health centers, nursing homes, and in some instances employers providing health services for their employees.

A third dimension by which we can classify service organizations is stage of illness. Beginning with prevention to deter illness, we go through possible stages of diagnosis, treatment, recuperation, rehabilitation and terminal illness. Associated with each of these stages are certain types of organizational structures, with some structures, such as general practitioners, dealing often with more than one stage.

One of the major research tasks in health service delivery is to examine the number and types of various organizations providing health services, particularly within a given community, and to compare the types of communities with different types of facilities. Are there any identifiable patterns in terms of community size, differentiation, and nearness to metropolitan areas and types of health services provided? If so, what are these patterns?

Another seemingly important research question is to examine more thoroughly than what has been done in the past, the coordination among organization within communities.[11] That is, to what extent does any kind of an integrated system exist? And further, what are community characteristics that seemed to be associated with an "efficient" system? Baker and O'Brien (1971) have offered a series of hypotheses regarding cooperation among human service agencies in communities. Milio (1971) and Klonglan and Paulson (1971) have recently reported on problems of interorganizatimal cooperation among health agencies.

Before answering the question of what characteristics are associated with an efficient system, some attention might well be given to development of an "ideal type" of system. Such an ideal type would provide a model to which existing systems could be compared. Analysis of deficiencies would be highlighted by such comparisons. Obviously care would have to be taken not to recommend any generalized model on to every community setting. The model to be developed would serve as a source of possible inputs into a particular community's system. It would be well if the overall community model had subsystem models which could be adapted readily to communities needing these and ready to adopt them. For example, an emergency health care system would be a subsystem model to be developed within a total community health model.

Such a model would also have to allow for intercommunity cocperation and coordination on more sophisticated aspects of health

care which require more expensive personnel and equipment, and which, because of cost and infrequency of use, would be prohibitive for any one small community to afford.

The overall system-model would have to be dynamic in nature and heavily oriented to process as well as structure. In our northeast group, Jim Longest has been our strong advocate for process analysis and I think he has me pretty well convinced of its importance.[12] Any research on "ideal systems" should clearly incorporate a process analysis of the steps by which ommunities with successes achieved these successes. The study of demonstration projects along these lines would be valuable and would involve evaluation research, with more than the usual before and after measures.[13] Thorough process analysis is an important and necessary ingredient in model development and adaptation. And answers should be sought as to how these models vary among communities and states.

At what point in terms of cost, manpower restrictions, likely frequency of use, seriousness of the illness, and other possible constraints, does a community have to recognize that it is not in a position to consider its own XYZ subsystem, but must look to cooperation with neighboring communities of a similar size, or even beyond, along with a group of similar sized communities, to some larger metropolitan area.[14] Linear programming techniques would appear to have much to offer in this regard. (Park and Freeman, 1969) However, it should be kept in mind that linear programming of services for people cannot be as readily accomplished as that for a production firm where control is much easier.

Adaptation of the total model, or any of its subsystems, or adaptation of any model to a real community setting does, of course, pose numerous problems (Weckworth, 1970) and these should be researched. As years of development work have shown, people and institutions do not readily change in favor of some substitute which is deemed to be more rational. Too, some health service systems have other functions than health care. Ambulances, and other emergency and fire safety equipment, for example, are deemed by many communities to be necessities for Memorial Day, Fourth of July and other holiday parades.[15] In such situations, consideration should be given to ways by which more rational systems could be added to or integrated with existing systems. The role of public affairs education programs should not be overlooked.

The construction of "realistic" models for health service delivery systems, then, is a needed research task and one which should involve a strong emphasis on what might be called "community adaptive processes." One model for health services which is currently being discussed, and the applicability of which to nonmetropolitan areas could be researched, is one which has been called a "three tier" system. (Elinoff, 1971) This model includes three tiers or layers of health systems. The first would be a primary health care center which would be responsible for first line prevention, diagnosis and treatment, and less serious emergencies. <u>All</u> patient contact with the broader health

care system would be initially made through this center. It is ideally conceived as providing 24-hour coverage.

This primary point of contact is viewed as essential by a number of writers on health. It is held by some to be the means by which health care can be "humanized," the one point at which the patient is viewed as a total human being. (Appel, 1970:162) With a primary point of entry functioning well, specialization at other levels would not fragment the patient's care as it does at present. (Yerby: 1966, 1243; Fink:1970, 13)

Garrison (1971) argues that if the general practitioner were backed up with good facilities and other desirable amenities (which the comprehensive primary care center would provide if properly developed), it would not be as difficult to meet the demand for general practitioners.

Garfield (1970) sees the strength of a primary care center as a point at which the well are spearated from the sick, a task, which it is argued, is presently not being accomplished, and one which when not done results in higher costs. It is further expected that such a center will facilitate coordination and referral of a patient to appropriate needed services.

All of the above presumed merits of a primary health center clearly represent beginnings of hypotheses for researchers. Intra-center analysis would also provide an area for research. What combinations of manpower and equipment do the "job" best? Scott (1966) offers organizational research opportunities which apply to this setting as well as other organizational settings.

The second tier in this three tier system would be the intermediate general hospital, sometimes referred to as satellite hospital in view of its relationship to the third tier, a sophisticated, highly equipped medical center. The intermediate hospital would handle emergencies too complex for the local health center but defined as not serious enough to warrant transfer to the medical center. The sophisticated medical center would be used for such complex procedures as brain surgery, cobalt treatment, and other procedures requiring highly skilled and specialized manpower, and expensive equipment.[16] Problems of getting hospital boards of directors and community leaders and residents to give up some hospital autonomy provide sociologists with a high priority research area.

I have not seen much discussion of recuperative services or organization for terminal illness in such a model. Further thought and development is needed in these respects since much recuperation and some management of terminal illness can be provided outside hospital walls through extended care facilities and/or home health care agencies. When feasible, such out-of-hospital arrangements can reduce cost.

The three tier model does hold considerable merit. However, as Hildreth cautions about models in general, and Garfield (1971) about prepaid group practice as another model, no one model will serve best

as the final answer. The study of processes of adaptation should be an integral part of research on delivery systems.

Yet another problem of organization on which I wish to touch concerns the balance of private and public realms of health care. This matter also touches on financial arrangements. Anderson (1968) and others (Garfield, 1970; Shannon, 1969; Kissick, 1970) argue that any ultimate system arrived at for providing health care should probably have elements of both government and private funding, so that some degree of competition and alternatives are available. Donabedian (1971) raises the question of how much social responsibility there should be for personal health.

Anderson (1968) places great emphasis on the "bargaining process" as the means by which an efficient health system will be arrived at. A degree of economic competition seems to be viewed by a number of writers as insurance that the forces of the marketplace will increase quality. On the other hand, they recognize that there will be instances, most likely among rural and low income residents, where government will have to insure that health care does not drop below some level. (Kohn, 1966:53) Resources among these two groups are not adequate for quality health care systems. At what point does government funding become necessary? And by which level of government?

Tom Hady has pointed out that the concept of "merit want" may enter in here. In terms of this concept, policy makers may decide that quality health care is valued so highly on its "merit" that is should not be permitted to drop below some minimum level if marketplace forces tend to put it below some level deemed desirable. I hope I have interpreted Tom's comments correctly; if not, I hope he will correct me. I might add that Hiestand (1966:152-160) discusses a related notion in terms of manpower. I will take this up in the section on manpower.

This problem of public-private financing relates to organization, particularly with reference to the emerging concept of Health Maintenance Organizations (better known as HMO's).[17] HMO's are usually viewed as comprehensive, prepaid, group practice arrangement whereby for a flat sum subscribers receive comprehensive care. The three tier model I outlined could be set up in an HMO context. A crucial factor in HMO development is funding of start of capital. Should the government subsize this or not? Or should subscribers be solely responsible? The balance of government and private funding involve social, economic, and political issues.

Another problem with a high priority for research is the whole matter of consumer representation in health service organizational policy. Comprehensive health planning legislation mandates that various boards and committees of "A" (State) and "B" (Regional) agencies must be made up of 50 percent or more consumers. Who is a consumer? Does or is the representative permitted to participate? What motivates him to do so? What techniques are effective in increasing his participation? A fair amount of research has been done on this problem in highly urbanized settings. Much needs to be done in nonmetropolitan settings.[18]

From a community perspective, we need to conduct research on the economic impact of health services in the community. (Fuchs, 1966) How much employment does the health industry account for at the local level? Does this proportion vary by certain types of communities across states? Why? Are there governmental policies that have an influence?

A final suggestion on organization I would make is an analysis of communities' capabilities for initiating and implementing changes in service delivery systems. Why is it that some communities seem to have the wherewithall for taking advantage of federal and state monies that "come down the pike" while others do not? Grantsmanship is probably part of this, but I believe there is more. These processes of mobilization and response need further examination.

Research Priorities in Manpower

All statistics seem to point to the fact that the number of persons employed in the health field has increased very rapidly in recent years.[19] Exact numbers and percentage growth rates will vary by writers, but the general consensus is that there has been a large increase. The rapid increases have been especially large in "allied health manpower," rather than among physicians, and dentists. (Greenfield, 1969)

Hiestand (1966) has provided a rather comprehensive discussion of needed research in health manpower and it would be redundant for me to restate what he has written. I might note that his approach is primarily that of an economist but numerous sociological research questions are also raised. I do want to add a few points to what he has written, update some of his suggestions, as well as disagree with some of his comments.

Hiestand maintains that we do not lack for data on health manpower to conduct our research. I would disagree. He maintains that through professional societies, health agencies, licensing bodies, census data, and government reports on manpower we can obtain considerable information on health manpower. My own personal experience reveals that all of these sources have severe limitations when we attempt to do research at the local community level, the level which this paper is oriented.

Not all health professionals are members of professional societies, and in medicine, there even seems to be a decreasing representation of members.

Collection of manpower data from health agencies and central state licensing bodies requires a considerable amount of time, and therefore expense. When it is collected, there are often inconsistencies and errors which have to be corrected. Often by the time these data are collected, corrected and made available, they are two years old.

There is the whole question of arriving at measurement of full time equivalents when using gross statistics. This proved to be a very difficult question in a study of nursing home personnel in which I was involved. (The Pennsylvania State University, 1970) In this study we found a significant number of personnel employed on a part-time basis. As for physicians, some are retired or semi-retired but still maintain membership in associations and therefore are listed. Others may spend most of their time in administration or teaching. Any general listing, then, would not portray the "true" manpower picture.

Census data do provide one way to collect information on occupation and industry of employed persons, but they are collected only once every ten years.

In our Pennsylvania research, Sam Leadley and I are beginning to explore the possibility of using telephone directories to identify physicians and dentists. This is being done on the assumptions that these listings are current and that unlisted numbers are not frequent among nonmetropolitan physicians. We hope that eventually some means might be worked out whereby telephone companies might be able to provide an up-to-date and inexpensive output in this regard. However, this approach will provide information primarily on physicians and dentists, and to some degree, nurses and physical therapists.

Much research with a methodological bent needs to be undertaken to provide means by which up-to-date manpower information can be made rapidly available for different geographic and political areas. Identification of patterns of distribution of manpower is a necessary first step towards manpower assessment. Hassinger and Hobbs (1967), Curry et al. (1971), Marshall et al. (1971), and others have published examples of what can be done. But again, I would suspect their data are subject to some of the limitations I mentioned earlier.

An addition I would make to Hiestand's (1966) comments is that research should be done on "health career programs" presently being conducted in several parts of the country to increase the supply of allied health manpower.[20] Hiestand (1966:160-164) notes that studies of motivation and occupational choice in reference to health occupations is needed, and that such research directed toward the allied health occupations is particularly deficient. Analysis of health career programs would help to evaluate a very active and somewhat successful way of increasing the interest of young persons in health occupations.

For economists, I think Hiestand's suggestions on manpower demand analysis holds many research opportunities. In particular, I find appealing his discussion and suggestions regarding the distinctions between demand, need and want, and how these enter into supply and demand of physicians. (Hiestand, 1966:155-160) He argues that if the public valued health care and physicians highly enough, and <u>assuming</u> no imperfections in the marketplace, then there would be no shortage. The assumption of no imperfection, as well as consideration of the notion of "merit want" mentioned earlier, figure very importantly here.

Research on variation in supply of manpower among communities within various states would undoubtedly shed light on the matter of public value and supply.

A trend deserving research, and one which has accelerated very rapidly in the past few years since Hiestand's article, is that of using nonphysicians to perform diagnostic and elementary treatment functions in first line or primary care contexts.[21] Pediatricians seem to have been in the forefront of this trend and have produced some major innovations. (Connelly and Yankauer, 1969 and Strain and Miller, 1971) There are a number of issues surrounding the use of physician's assistants, nurse practitioners and other occupations labeled with similar titles. These have been recently summarized rather well by Adamson (1971). How much of his duties is the professional willing to delegate? What legal considerations enter into use? What is the patient's reaction? My own experience in a state health agency where assistants have been employed leads me to hypothesize that the professional's definition of his own role is important. "What will I do if an assistant is hired to perform some of my duties?" Some professionals have defined their work so much in terms of less complex duties that they have institutionalized their own waste.

A recent directory of training programs for physician support personnel has been published and lists some 125 programs in 35 states where these persons are being trained. (U.S. Dept. HEW, 1971) Research on the present utilization and possible utilization of such persons in rural health centers near the training institutions would seem to deserve rather high priority, especially in terms of their acceptance by patients and existing physicians.[22]

Another question needing research is how much control does the physician lose through delegation. And what, if any, are the consequences of this loss? Millis has asserted that increased division of labor in health care decreases responsibility on the individual previously responsible for patient care. (Millis, 1969:499) Is this so and what are the implications of this? Also, comparison of output in relation to production costs of health care with various mixes of personnel in various settings is of rather high priority.[23]

Research Priorities in Utilization

Utilization can be viewed as one side of the coin of the health delivery process, with provision being the other side. My previous comments have dealt with the provision processes. I would like now to turn to some research priorities in utilization, as I view them.

In a summary of utilization research, Fink (1970:11) notes that a useful distinction can be made between <u>health</u> utilization and <u>illness</u> utilization of services. This seems an important distinction to make in view of the shift in major causes of death from acute and infectious diseases to accidents and such chronic diseases as heart disease, cancer, stroke, and diabetes. Reduction of death and disability

from the latter causes of death, sometimes called diseases of affluence, requires utilization of preventive services when one is well so that one may continue to remain in good health. Latent and less painful problems of high blood pressure, overweight, blood sugar imbalance, high fat and cholesterol blood levels and heart irregularities, to wit, are often not seen as important determinants of health status.[24]

Studies have shown that as income and educational levels increase, utilization of services increases. (Fink, 1970:11) Data also indicate that this increased utilization associated with income and education is more for preventive services rather than treatment. (Fink, 1970:11) What are the implications of this for local community services? One implication is that greater use of preventive and detection services calls for follow-up and social support mechanisms to help individuals carry out recommended preventive practices which frequently involve rather drastic alterations in patterns of living. These questions have particular relevance to rural areas where more dispersed populations make organization of social support mechanisms more difficult. Specific examples here would be the problems in organizing coronary clubs and overweight clubs.

Pope and his associates (1971) analyze the pattern of telephone reporting of symptoms. Further study of this in rural areas may provide suggestions for increasing access and reducing costs since transportation is a limiting factor in nonmetropolitan areas.

In nonmetropolitan areas, utilization is much influenced by availability and accessibility. How can you use a service if it's not there or you can't get to it? This point leads me to mention an important area of research which has been suggested by Smith and Arnold.[25] They contend that we do not begin to know enough as to how individuals in rural areas cope with illness and disease when availability and accessibility are problems. They further assert that before we speak of adding or substituting services, we should first have a rather thorough knowledge of how rural residents already cope with illness, and then build upon these findings, rather than attempt automatically to introduce service systems found appropriate elsewhere. What knowledge, beliefs, and practices exist and are presently employed? This seems especially worthy of attention in view of cost and institutional problems involved in organizing new services.

Further research and refinement is needed in the whole area of demand for services. What is the nature of the demand for health services?[26] Does this vary by type of service? How? Hady has suggested that possibly we have an element of derived demand in nonmetropolitan areas as policy makers attempt to encourage development of rural areas.[27] Is this the case or not?

Studies of utilization should accompany any new program designed to demonstrate the effectiveness of new forms of organization. The only way new organizational forms can be successful is to be used. Does the new organization increase accessibility and availability? Or, does it alienate users to such a point that they bypass the new organization and continue with old patterns? What "mistakes" were made?[28]

Mechanic (1968:365-403) discusses organizational factors involved in patient care and points to several research questions.

Research Priorities in Finances

That all people should have relatively equal access to health services regardless of financial status is a rather well accepted dictum guiding health policy in America today. (Anderson, 1966:39) The question of how to achieve this is another matter. Such achievement involves patterns of organization described earlier. Somers (1970:168) and Burns (1971:2164) both writing on finances, note that cost and organization are closely linked. Manpower distribution is also clearly involved. And the financial issue itself is a significant factor. The phrase "regardless of financial status" immediately implies that some form of subsidization may well be necessary.

I am not an economist and I do not plan to dwell at length on the many possible research questions related to financing health care, or other economic aspects of health. In the three preceding sections, I alluded to several possible economic research activities that might be undertaken. In this present section I should only like to note the import of the financial aspect, and suggest a few additional areas of needed research.

The economics of health are certainly an important component of the total problem of health delivery. In 1968-1969, Americans spent over $60 billion on health care, including doctor fees, hospital costs, costs of medicines and other related costs. (Somers, 1970:170) These expenditures represented 6.7 percent of the GNP. In 1928-1929, expenditures of $3.5 billion represented 3.6 percent of the GNP. (Somers, 1970:170) For the year ending June 30, 1969, per capita expenditures on health were almost $300. (Somers, 1970:169)

Questions of how to reduce costs and/or improve on financing health care have become a national concern. The last eighteen months have seen a large number of bills introduced into Congress, which are attempts to deal with the financial problem. (Burns, 1971:2164) According to Burns, there seems to be considerable unanimity as to objectives of proposals for reform in delivering and financing health care. These are:

(1) Access to needed health services must not be impeded by financial barriers.

(2) The delivery system must be one in which comprehensive and continuous service is available in contexts suitable to the patient.

(3) Services must be provided efficiently with due regard to economy of resources.

(4) The system must be accountable to those who finance it. (Burns, 1971:2164)

Items 1, 3 and 4 clearly refer to financial aspects of the problem, and from these follow numerous problems for economists to examine.

What economic models are "best suitable" for allocation of health resources and facilities in nonmetropolitan areas? In the section on organization, I described one alternative for organizing health service delivery. What are the cost factors in that model? Are there present systems that deliver better quality care at lower cost when compared to others? Are any more economical and efficient patterns achieved when regulatory mechanisms relating to facility construction are present as they are in California, New York and Rhode Island when compared to states without such regulations? (Somers, 1970:189) C. T. Stewart (1971) analyzes resource allocation from the standpoint of treatment, prevention, research and information. Somers raises a number of what he calls "Unanswered Hospital Cost Rise Questions:"

> It cannot be questioned that there has been a great expansion of facilities, equipment, personnel, and services. But how much represents unnecessary duplication of facilities and equipment among several hospitals within the same community, because each hospital behaves as an autonomous unit rather than as part of a coordinated health care system? How much of the new equipment are prestige or convenience items?
>
> How much of the mounting increase in ancillary services is simply a result of the spread of third-party payment which has reduced the physician's inhibitions to additional laboratory procedures or an additional day's stay in hospital, and the individual consumer's resistance to higher costs, on which a normal market situation would place considerable reliance?
>
> Has there been any attempt to measure the relative value to health care represented by new equipment and added services, or are "improved models" bought without such criteria because hospitals now have a virtual guarantee of repayment of all their costs from third-party payors? Has there been progress toward developing measures of cost-benefit relationships? (Somers, 1970: 183-184)

A number of writers have suggested that the area of productivity of health personnel and facilities holds a number of unanswered questions. (Appel, 1970:145; Somers, 1970:185; Millis, 1969:500) Sam Cardos, presently a graduate student in agricultural economics at Washington State University, is researching the productivity of physicians in several sized group practices and in solo practice.[29] He is finding that the matter of quality enters into any analysis of productivity. Somers asserts that a labor-intensive personal service industry will have more difficulty improving productivity than will manufacturing firms.

(Somers, 1970:185) Is this so, and if so, what can be done to overcome the difficulties, particularly in sparsely populated areas where manpower is extremely limited?

One final point on finances which I would like to note is the matter of cost-benefit analysis, an important area for economic research in any service delivery system context. Anderson offers some very valid justification for asserting that "it is inappropriate to apply cost-benefit analysis to a health service because the primary public policy interest should be aimed at alleviating pain and suffering and reducing the number of premature deaths." (Anderson, 1968:88) He feels cost effectiveness analysis can be carried out but that "the benefit aspect of cost-benefit analysis is meaningless in economic terms if my premise is accepted, and irrelevant in a society which regards the individual as inviolable." (Anderson, 1968:88)

The question of cost-benefit vs. cost effectiveness analysis obviously has strong value connotations. These questions need to be wrestled with and resolved so that more work can be done towards some form of cost analysis in order that efficient allocation of resources is achieved.

Summary

This paper has described what I deemed to be high priority research problems within four major health problem areas--organization, manpower, utilization and finance. I began with the elementary paradigm of the consumer, provider and community of context, and the two processes of provision and utilization, noting that this basically is what community service delivery is about.

I then reviewed the interaction between several disciplines and health problem areas of organization, manpower utilization and finance. The solution of community service problems involves many disciplines.

The remainder of the paper was devoted to outlining high priority research problems in the areas of organization, manpower, utilization and finance. Under organization, I discussed the very pressing issue of obtaining systematization and coordination among health services and the need for process analysis. I discussed the three-tier system as one alternative.

High priority items in health manpower are: (1) the need for reliable and realistic manpower data, (2) analysis of the demand, supply and distribution of health manpower, and (3) analysis of past, present and forthcoming programs involving the greater use of allied health manpower.

In utilization, there is a need to examine the implications of the shift in causes of death from infectious to chronic. Also, much more knowledge is needed about present coping mechanisms and the demand for health services.

Needed in financing are studies on allocation and productivity of resources as well as cost effectiveness analysis.

With this, I conclude my analysis of research priorities in nonmetropolitan health problems.

Notes

1. Williams (1970) presents one of the best descriptions of American Society's institutions and values.

2. Sigler and Bryant (1966) seem to explicitly recognize these two sides of the same coin in labeling their bibliography.

3. Based on correspondence received from Ploch and Hady.

4. Yerby (1966:1240), among others, also lists these as priorities.

5. Health facilities as a topic for further research is discussed at some length by Lord Llewelyn-Davies (1966).

6. Blum (1966:54) also intimates this priority.

7. Margaret Read's book (1966) deals effectively with relationships among "Health, Culture and Disease."

8. Appropriate references will be noted and discussed in later sections of this paper.

9. Kauffman (1966) discusses the political factor as a neglected area of research.

10. For a discussion of formation of county health departments in one state, Pennsylvania, see Crawford (1969).

11. This point is strongly made in terms of rural areas in Kohn's (1966:107-133) report on health services in Canada.

12. Wilkinson (1969 and 1970) takes approaches to community change and development which seems to stress the importance of research on process analysis.

13. Borgatta (1966), Densen (1970), and Suchman (1967) are a few of the many writers who have made relevant comments on the evaluation of health programs. However, they do not stress process evaluation as much as it could be discussed.

14. Hildreth (1971:4) implies that this possible relationship to metropolitan area services needs to be considered more than it has in the past.

15. This point was recently emphasized to me by the Director of the Office of Emergency Health Services in the Pennsylvania Department of Health. It is a very real problem in coordinating and maximizing efficiency among emergency care systems among nonmetropolitan communities.

16. Management and organizational analyses of hospitals is another potential area of research. See Feldstein (1968), Revans (1966), and Scott (1966).

17. For an extensive discussion of Health Maintenance Organizations the reader is referred to a series of articles in the journal Hospitals which report on a conference held by the American Hospital Association (1971).

18. The writer is presently serving as a consultant to a study of this problem in a medium sized metropolitan area and a rural area in Pennsylvania.

19. See Greenfield (1969) for a comprehensive summary of total health manpower and allied health manpower in particular.

20. An example of one such program and a report on its evaluation can be found in Crawford (1971a) and Crawford, et al. (1971).

21. A description of a most recent example is contained in a news release by the American Medical Association (1971).

    A list of some 125 programs in 35 states designed to train physician support personnel has recently been compiled. (U.S. Dept. of HEW, 1971)

    A potential role of family members and other nonphysician personnel in performing care and recuperative functions is briefly discussed by Crawford (1971b:120-121).

22. An example of one such program for rural areas is contained in a news release by the American Medical Association (1971).

23. Samuel Cardos at Washington State University is presently researching this problem. (Personal conversation)

24. Rosenstock (1966) reviews at length the importance of perceived susceptibility and seriousness of health problems as these affect utilization.

25. Personal conversations with William Smith and Mary Arnold, both of whom are at Penn State.

26. Boulding (1966) and Jeffers (1971) are among those who have attempted to examine this problem.

27. Personal correspondence.

28. Fink (1970:16-22) discusses the relationship between organization and utilization. Harrison (1969) documents clearly what can happen when a new health service delivery arm of a hospital is established without proper groundwork.

29. Personal conversation.

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*The following journal abbreviations are used in the references:

AJPH - American Journal of Public Health
BNYAM - Bulletin of New York Academy of Medicine
JAGS - Journal of American Geriatrics Society
JAMA - Journal of American Medical Association
JHSB - Journal of Health and Social Behavior
JHR - Journal of Human Resources
MMFQ - Milbank Memorial Fund Quarterly
NEJM - New England Journal of Medicine
PHR - Public Health Reports
PCNA - Pediatric Clinics of North America
RS - Rural Sociology

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HOUSING QUALITY: MEASUREMENT AND ASSESSMENT

by

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This paper was presented at the National Workshop and Joint Technical Committee Meeting on Problems of Research on Delivery of Community Services in Rural Areas, Nebraska Center for Continuing Education, Lincoln, Nebraska, December 13-16, 1971

HOUSING QUALITY: MEASUREMENT AND ASSESSMENT

General Introduction

For policymakers who are concerned with housing quality, there are two basic questions which need to be answered: (1) what is the actual distribution of quality within the housing stock, and (2) what are the critical factors which interact to determine that distribution of housing quality? Finding a good answer to the first question requires that several basic problems associated with the measurement of housing quality must be adequately resolved. An attempted resolution of some of those key problems of quality measurement is carried out in the first half of this paper.

Providing a good answer to the second question posed above is not as easy as it might seem. At a superficial level, it is evident that the quality of a housing unit declines over time primarily as a result of inadequate maintenance expenditures.[1] However, this statement by itself is of limited value, and cannot serve to explain the distribution of housing quality, primarily because it cannot predict the quality level at which the average housing unit will be demolished.

Clearly, the distribution of housing quality is one of the outputs of the interaction between supply and demand in the total market for housing. In recognition of this fact, the second half of this paper is devoted to setting up a rigorous (if idealized) mathematical equilibrium model of the total housing market. On the basis of the parameters fed into it, the model will predict both the average level of housing quality, and the distribution of housing quality.

It is hoped that the model presented will aid policymakers in their understanding of the market forces which influence housing quality. With an increased understanding of those forces, policymakers might be better able to develop sound programs for improving the quality of the housing stock.

Part I: Problems of Measuring Housing Quality

The problems of measuring housing quality are numerous; however, the progression of ideas developed here are presented in the following sequence: (1) scale of measure to be used, (2) reliability of measure, and (3) indexes of multidimensional quality measures.

Housing quality is fundamentally an attribute of housing which is subjectively perceived by the consumers of housing services. As an attribute, housing quality is a meaningfully distinct concept from the quantity of housing.[2] This does not deny the impact which objective physical conditions have upon the perceived level of housing quality.[3] One consequence of the subjective nature of housing quality is that it is meaningless to say that "House A has x times as much quality as House B." As a result, housing quality can, at most, be measured on an ordinal scale.

In general, the particular choice of ordinal scale is a matter of convenience; because any ranking on one ordinal scale embodies the

same "knowledge" that would exist for that same ranking placed on another ordinal scale. To see this point, examine Chart A where two different ordinal scales are used in a plot of "other goods" versus housing quality. Both indifference curves (I and I') represent the same level of utility, since the points on one curve correspond to the same "objective conditions" (ex. G_b,b) which are also represented on the other curve.

Ideally, housing quality would be measured on a continuous ordinal scale; however, the problem of measurement reliability prevents this. To achieve acceptable levels of reliability, housing quality must be measured on a segmented ordinal scale. In order to develop this position on a theoretical level, it is expedient to set up a simplified model of the measuring process on a segmented scale.

First of all, reliability is a relative concept which can be defined in terms of a percentage statistic. Specifically, reliability is that percentage of a sample of housing units assigned to a particular segment (of an ordinal scale) that would on average be assigned to that same segment, after repeated measuring experiments on the original sample of housing units. The idea that plays a key role here is that housing units on the "border" between segments of different quality will often be incorrectly assigned.

Consider Chart B where the vertical axis represents the percentage of housing units at an actual quality level "q" (measured on the horizontal axis) which are assigned to one quality segment or another. Ideally, all units and only units in the rectangle P[2]P[5]P[7]P[10] would be assigned to the "medium" quality segment. Unfortunately, unavoidably vague instructions[4] lead enumerators, on average, to assign housing units in the parallelogram P[1]P[4]P[6]P[9] to the "medium" quality segment. As a result, in the average sample units P[3]P[4]P[5] and P[8]P[9]P[10] are inappropriately included, and units P[1]P[2]P[3] and P[6]P[7]P[8] are inappropriately excluded.

Using relatively simple assumptions (see Appendix A), the above model leads to the following expected value for the reliability statistic,

$$E(R) = 1 - \frac{b}{3(a+b)} \tag{1}$$

where "a" is the width of the zone of 100.0 percent certain and correct assignment, and "b" is the width of the zone of uncertain and sometimes incorrect assignment (see Chart B). The expected value of R, E(R) is bounded below by 2/3 and above by 1.[5] Improvements in reliability can be achieved in either of two ways. First, by improving the discriminating power of the instructions for measuring quality, "b" may be reduced which will cause E(r) to rise. And second, for a given "b", the value of E(R) can be raised by causing "a" to increase through diminishing the number of quality segments on the scale (e.g. moving from a trichotomous division to a dichotomous division).

The desire to achieve an adequate level of reliability may lead to the adoption of an ordinal scale which has very few segments, and

consequently little discriminating power. The absense of such discriminating power will be directly reflected in the relative percentage of "observations" which are "ties".

In reality, the quality of housing is clearly a multidimensional concept. As such it poses an index number problem for those researchers who want a single scalar measure of housing quality. To see this problem, consider the measure of housing quality which was developed by the American Public Health Association (APHA).[6] Their measurement scheme was to be implemented by assigning penalty points to deficiencies of the dwelling unit or its environment[7] on a scale of from 1 to 30, for each of 30 items in the unit itself and for 24 items of the environment. However, the APHA decided that not all items "should" be weighted equally. As a consequence, "maximum standard penalty scores" were imposed on an item by item basis.[8] Clearly, there must have been a rationale for assigning different "weights" to the various items. Undoubtedly the APHA would tend to weight items on their relation to health and safety. However, if our concern is with the impact of housing quality within the housing market, let us see how such weightings might be determined on the assumption that a quality index should be "consistently" related to a consumer's perception of housing quality.

For the sake of argument suppose that there are just two dimensions of housing quality. In addition, assume that each dimension or item of housing quality is related to an ordinal scale by some measurement function defined upon the relevant "objective conditions" of the housing unit: Symbolically,

$$(2) \qquad Q_i = Q_i^*(OC_j....) \cdot \begin{matrix} i = 1,2 \\ j = 1,... \end{matrix}$$

Consider some particular individual who experiences trade-offs between the two dimensions of quality which can be represented in indifference form in Chart C. Assume that it is established that R_1OR_2 is the empirically relevant range of quality combinations. An index of housing quality for this individual would be specified as

$$(3) \qquad I = W_1Q_1 + W_2Q_2$$

How are weights W_1 and W_2 to be chosen? Clearly, to avoid ambiguity, different bundles of quality (Q_1,Q_2) which give the same index value should have roughly the same perceived quality level. Because of this requirement, the index function really serves as a linear approximation to one of the indifference curves of the individual's indifference set. In Chart C I_2I_2 embodies a better set of weights than does I_1I_1, since the former is a better approximation of U_2 in the range R_1OR_2, than is the latter.

In order to generalize the above observations so that they apply to some selected group of individuals, it is necessary to construct some kind of average indifference surface. Consider Chart D. All individuals in the group are assumed to have indifference curves passing through points P on ray OS. Points P' on curve U_aU_a are

determined such that half of the group feels that any point P' is inferior to P and the other half feels that it is superior. The line through P and tangent to the curve U_aU_a, then defines the optimal weights for a housing quality index for this group. The reason for placing the common point P on ray OS is to minimize the average error of the linear approximation II (i.e. For such a choice of P, persons would be less inclined to experience strong preferences between point P and the "average" point P').

The above approach to looking at the weights in the quality index suggests at least one way of improving the APHA quality rating scheme. It seems that the scoring of deficiencies should be separated from the procedure of weighting them in the construction of an overall index of housing quality. It is unreasonable to ask an enumerator to use more than one ordinal scale for rating the various different dimensions of housing quality.

The problems of implementing the principles derived in the above discussion are very difficult. The practical use of such principles is undoubtedly contingent upon the setting up of a practical revealed preference scheme. However, the setting up of such a scheme is beyond the scope of this paper.

In a recent paper on the Quality of Housing[9], Professor Earl Morris of Cornell developed some empirical evidence which suggests that for certain empirical reasons the above discussion of quality indexes may be superfluous. He found that correlations between a wide selection of pairs of quality indexes were, in general, very high. This result suggests that, for a sample of housing units, the rankings of the different dimensions of quality dimension will embody most of the information on ranks that can be obtained from the sample In other words, it might be possible to dispense with the construction of quality indexes.

However, a word of caution should be interjected at this point. The correlation results presented above might only be the result of the crudeness of the ordinal scale used (i.e. The result of using a small number of segment levels). Chart E illustrates in a qualitative way how the use of a segmented ordinal scale might possibly increase (Case 3) or reduce (Case 2) the rank correlations between two different dimensions of quality. The circles represent the actual, but unobservable, pairs of quality rankings for housing units in three, arbitrary, hypothetical samples of housing units. It is assumed that there actually are some underlying ordinal rankings on a continuous scale which would be "discovered", if measurement techniques were refined enough. In particular, one should "worry" about the existence of case 3 on Chart E.

Part II: Economic Determinants of Housing Quality: A Synoptic Sketch of a Total (Stock and Flow) Housing Market Model

As noted in the previous section, housing quality is an n-dimensional concept. However, in practical analytic or empirical work an

arbitrary, but specific, number of quality dimensions must be chosen. In the analysis which follows, it is convenient to postulate that housing quality has the two independent dimensions of (1) style and (2) physical condition. It is assumed that owners of housing have control over the physical condition of their units through their expenditures on maintenance. More specifically, the physical condition of a housing unit declines in proportion to the gap between the maintenance expenditures needed to keep the structure in "like new" condition and the maintenance expenditures actually made. However, the impact of style obsolescence on quality is untouchable and is "influenced" only by complete demolition and rebuilding. In fact, at any given level of physical quality, stylistic obsolescence autonomously reduces overall quality as a function of time. In summary, corresponding to each time path of maintenance expenditures is a time path for the quality of a housing unit.

In order to avoid having to contend with the impact which the family life cycle has upon maintenance expenditures, it is assumed that all owners of housing behave like profit maximizing landlords. (As a consequence, the model strictly applies only to rental housing.) Housing owners must somehow juggle their time paths of maintenance expenditures in order to maximize the present value of their investments. Specifically, they must choose the optimal maintenance time path which balances the trade-off between the positive impact of maintenance expenditures on the economic life of their project, and the negative impact of those same expenditures on their project's net income flows. In simplistic terms, they must make an optimal choice somewhere between a larger net income flow for a short period and a smaller net income flow for a long period. In addition, the annual flow of new construction is carried to that point at which the landlords net return to housing is the same as the return on all other capital goods.

In making their capital and maintenance decisions, landlords are assumed to have a perfect knowledge of the behavior of both individual households and the total housing market. In regard to households, they know that households with any given income level will offer less for housing of lower quality. For the housing market as a whole, landlords know that the following two conditions hold. First, supply and demand must be equated for housing within each age (or quality) group. Second, there must be a "condition of equilibrium" between the markets for housing of different ages (or qualities).

One particularly interesting result follows from the "rational" behavior of households and landlords within the housing market. Assuming identical "tastes"... in equilibrium, a household's income level determines the point to which it moves within the age (or quality) distribution of housing. From another point of view, the household's position within the "pecking order" within that distribution is determined competitively by their indifference bid-rent curves.[11] The forces bringing about equilibrium are analogous to the forces causing the spatial locations of families within a city.[12]

Over time; households are assumed to continually "filter up" in order to maintain their equilibrium position within the age distribution of housing. However, the model provides more than a description of the filtering process. As formulated, the model generates a long-run equilibrium position for housing owners, consumers of housing services, and the construction industry.

Except for the inclusion of a variable representing the average rent of the land employed per housing unit in its "highest and best" alternative use, the model completely neglects locational considerations. This follows both for reasons of simplicity, and because the model's primary concern is with the situation of average households and landlords. In addition, in order to facilitate the development of the model, and to give it a testable empirical content, certain specific functional forms are used. Whether or not the functions employed have empirical relevance is a question to be answered by empirical testing.

For any given set of background conditions, the model should provide rough answers to questions of the following kind:

(1) In equilibrium, at what level of quality will it be economically rational to demolish a housing unit? (This information could then be used to determine the average quality of the housing stock.)

(2) In equilibrium, at what rate will housing deteriorate in quality? (Together with the answer to the first question; this knowledge would give both the average economic life of housing, and the proportion of the total stock to be replaced each year.)

In addition, comparative statistics experiments with the model should provide meaningful estimates of both the direction and magnitude of shifts in the equilibrium position; caused by autonomous or policy-induced shifts in background conditions.

Housing Quality and the Maintenance Gap

The actual cummulative gap in maintenance expenditures of a housing unit at any age "t" is given by the following integral

$$M_{ga}(t) = \int_0^t (m_n - m_a)\, dt \text{ , where} \tag{4}$$

m_n and m_a are the dollar flows of needed (to preserve in a "like new" physical condition) and actual maintenance expenditures, respectively. In order to make the model manageable, the following linear maintenance time paths were specified

$$m_n = m_o + \eta t \text{ and } m_a = m_o + \Theta t \tag{5}$$

Identical intercepts were imposed both for reasons of solvability, and because the cummulative impact of early maintenance neglect would argue against the adoption of an actual maintenance curve like OP in Chart F. The principle at work in this argument concerning "early neglect" is analogous to the idea that "an ounce of prevention is worth a pound of cure".

This same idea suggests that in its impact on the rate of current physical deterioration "early neglect" should be weighted more heavily than "recent neglect". Assume that the weight at age "t" for the instantaneous maintenance gap is $W(t) = 1/t$. This assumption leads to the following corrected cumulative gap in maintenance expenditures

$$M_{gc}(t) = \int_o^t 1/t\,(m_n - m_a)\,dt \tag{6}$$

For the specific maintenance functions chosen, the corrected cumulative gap function, $M_{gc}(t)$, is

$$M_{gc}(t) = (\eta - \theta) \cdot t \tag{7}$$

Although arbitrary, it is reasonable to assume that the rate at which a housing unit deteriorates physically is proportional to the maintenance gap, $M_{gc}(t)$. As a consequence of this assumption, the following negative exponential function for physical quality is appropriate

$$Q\ \text{physical} = Q_o \cdot e^{-\varepsilon \cdot M_{gc}(t)} = Q_o \cdot e^{-\varepsilon(\eta-\theta)t}, \tag{8}$$

where ε is a constant of proportionality.

For any given level of physical quality, the rate, "δ", at which overall housing quality falls, because of stylistic obsolescence, is asserted to be a function of age "t". In symbolic terms, this means that the overall quality-age function **for** housing is given by

$$Q(t) = Q_o \cdot e^{-\varepsilon(\eta-\theta)t} \cdot e^{-\delta t} = Q_o \cdot e^{(\varepsilon\theta - \varepsilon\eta - \delta)t} \tag{9}$$

The Individual Household Equilibrium

One of the requirements of the housing market model, being constructed, is that all of the functions used must have specific, quantifiable, analytic forms. As a consequence of this condition, it appears necessary to make the strong assumption that all households have the same set of preferences, and that those preferences can be represented by an analytic function.

Because of its simplicity, the following utility function was adopted

$$U = X^{\alpha} N^{\beta} Q^{\gamma} \tag{10}$$

where Q is housing quality
N is housing quantity
X is the dollar value of "all other" goods, and α, β, and γ are weights.

The household's budget constraint is

(11) $$y = X + N \cdot P$$

where y is income, and

P is the price per unit of housing

Maximizing utility, using the lagrangian function

(12) $$L^* = X^{\alpha} N^{\beta} Q^{\gamma} - \lambda(X + N \cdot P - y)$$

gives the following five first-order conditions

(13a) $$L^*_x = (\alpha/X) \cdot X^{\alpha} N^{\beta} Q^{\gamma} - \lambda = 0$$

(13b) $$L^*_n = (\beta/N) \cdot X^{\alpha} N^{\beta} Q^{\gamma} - \lambda \cdot P = 0$$

(13c) $$L^*_q = (\gamma/Q) \cdot X^{\alpha} N^{\beta} Q^{\gamma} = 0$$

(13d) $$L^*_t = (\gamma/Q)(dQ/dt) \cdot X^{\alpha} N^{\beta} Q^{\gamma} - \lambda[N \cdot (dP/dt)] = 0$$

(13e) $$L^*_{\lambda} = -(X + N \cdot P - y) = 0$$

The third condition for housing quality appears strange because it says that the price of quality is zero to the household. Quality has a zero price, because individual landlords and prospective tenants usually treat quality as a "given", and negotiate only over quantity and the price per unit of quantity. Although at a zero price a household would "ideally" consume an infinite amount of housing quality (given its preference set), in fact, its consumption of quality can be no more than that which exists in the housing of age "t" which it rents. Technically speaking, the household's equilibrium position with respect to housing quality is a type of corner solution.

The solutions to the first order conditions are as follows (See Appendix B for further details).

(14a) $N = [y/P(t)] \cdot [\beta/(\alpha+\beta)]$, using 13a, 13b, 13e

(14b) $X = y - N \cdot P(t)$, using 13e.

(14c) $Q = Q(t)$

(14d) $(1/P)(dP/dt) = (\gamma/\beta)(1/Q)(dQ/dt)$, using 13b,13d

The household's equilibrium position, as represented by the triplet (X,N,Q), will be determined in the context of the total housing market which determines the values [t,P(t),Q(t)] which confront him in equilibrium.

One thing is clear. Households will be indifferent between points along any hypothetical price-age curve of the form

(15) $$P(t) = C \cdot Q(t)^{\gamma/\beta}$$ (This is the indefinite integral of (14d).)

For positive value of C, this function represents the household's set of "bid rent" functions which help to determine its equilibrium position within the age (or quality) distribution of the housing stock. Because the household's bid-rent set is independent of income, it turns out that the total housing market price-age function has the same form as (15). (See Appendix C for a utility function that leads to a bid-rent set which is income dependent.)

In the previous section, the landlord's maintenance expenditures were shown to be a partial determinant of the quality-age function. A glance at equation (15) will reveal that those same maintenance expenditures help determine the total housing market price-age function.

The Individual Landlord (firm) Equilibrium

Many simplifications of reality are required in order to set up a model of landlord behavior which fits easily into the framework of a total housing market model. A partial listing of some of the principle simplifications is given below:

(1) Income taxes are unimportant so that landlords make their decisions on the basis of before income-tax revenues.
(2) Landlords lease the land upon which their housing units are located for the duration, t', of their investment. In addition, on the basis of the return to land in its "highest and best" alternative use, landlords contract to pay a constant land rent of "L" dollars per unit of time on the land used per unit of housing. These assumptions make it possible to treat the return to land as just another operating cost, and to avoid the difficulties of explicitly dealing with reversion values.
(3) For the relevant (possible) range of per unit construction costs, the amount of borrowings per unit is assumed to be a fixed amount. As a result, the landlord's capital investment will be the difference between the construction cost per unit and that fixed level of borrowings per unit.
(4) Housing is assumed to be infinitely divisible which together with the assumed household preference set leads to a zero rate of housing vacancy. This latter result is not unreasonable for a model that deals with the long-run equilibrium position of households. (Of course, the assumption of perfect household mobility is also required, since as housing ages, it must "filter down".)
(5) Landlords are assumed to make their borrowing and sinking fund arrangements over the total duration t' of their investment.

The rational landlord will invest in housing units when the discounted present value, PV, of his investment, using the rate of

return, r, in alternative forms of capital, is greater than or equal to the sum of the structure and demolition costs minus borrowings. Considered on a per (housing) unit basis; this is the same as the inequality statement

(16) (Structural Cost per Unit) + (Pro-rated Demolition Cost per Unit) - (Borrowings per unit) $\leq$ (Present Value of Investment per Unit)

Discounting continuously, the incremental contribution of the net income flow at time t to an investment's present value, PV, is given by the expression

(17) $$d(PV) = [P(t) - \{A(t) + I(t)\} - S(t) - L - M(t) - T_1 \cdot P(t)]e^{-rt} \cdot dt,$$

where the explicit functions for the terms in the expression are as follows:

(18) $$P(t) = \bar{c} \cdot e^{qt}, \text{ where } \bar{c} = c \cdot Q_o^{\frac{\gamma}{\beta}}$$

$$\text{and } q = \frac{\gamma}{\beta}(\varepsilon\Theta - \varepsilon\eta - \delta)$$

(19) $$A(t) = \frac{r \cdot \bar{F} \cdot e^{-rt}}{[1-e^{-rt'}]}, \text{ where } \bar{F} = \text{(Borrowing per unit)}$$

(20) $$I(t) = \frac{r \cdot \bar{F}\,[e^{-rt} - e^{-rt'}]}{[1 - e^{-rt'}]}$$

(21) $$S(t) = [1/(t'e^{rt'})] \cdot e^{rt} \cdot PV$$

(22) $$L = \bar{L}, \text{ a constant}$$

(23) $$M(t) = m_0 + \Theta t$$

A few comments about the above functions are appropriate. Function (23); the "actual maintenance" function, was defined in the section dealing with the maintenance gap. Function (22) simply states that land costs are a constant amount per unit of time. Functions (21), (20), and (19) specify, respectively, the costs at time t, of the sinking fund, the interest on the outstanding debt, and the amortization of the debt. The parameter t' represents the point in time at which these costs are assumed to terminate. (The derivation of the latter three functions is carried out in Appendix B. Function (18) specifies the equilibrium price-age function for the age distribution of the total housing stock. The explicit form for the market price-age function is obtained by combining the household's general price-age function (15) with the landlord's quality age function (9). The resulting function is appropriate because, irrespective of their incomes, all households have the same sets of "bid rent" curves. The constant $\bar{c}$ in the price-age function which specifies the "height" of that function is derived in the section of the paper dealing with the equilibrium of the housing stock.

On the condition that all of the above functions are appropriate, it is then necessary to derive the landlord's present value function from the differential function d(PV). Substituting functions (18-23) into the "derivative" portion of the differential function gives the following linear differential equation of the first order

(24)
$$\frac{d(PV)}{dt} = -\frac{e^{-rt'}}{t'} \cdot PV + [(1-T_1)\cdot\bar{c}]e^{(q-r)t}$$
$$\frac{-r\cdot\bar{F}\cdot e^{-2rt}}{(1-e^{-rt'})} - \frac{r\bar{F}[e^{-2rt}-e^{-r(t+t')}]}{(1-e^{-rt'})}$$
$$-(\bar{L}+m_o)e^{-rt} - \Theta\cdot t\cdot e^{-rt}$$

The solution of this equation is as follows

(25)
$$PV(t) = \phi_1 e^{(q-r)t} + \phi_2 e^{-2rt} + \phi_3 e^{-rt}$$
$$+ \phi_4 e^{-v_o t} + \phi_5\cdot t\cdot e^{-rt}$$

where

$$q = (\gamma/\beta)\ (\varepsilon\Theta - \varepsilon\eta - \delta)$$

$$V_o = (e^{-rt'}/t')$$

$$\phi_1 = \frac{(1-T_1)\cdot\bar{c}}{(e^{-rt'}/t') + (\gamma/\beta)\ (\varepsilon\Theta-\varepsilon\eta-\delta)-r}$$

$$\phi_2 = \frac{-2r\bar{F}}{(1-e^{-rt'})\ [(e^{-rt'}/t') - 2r]}$$

$$\phi_3 = \frac{\{\Theta(1-e^{-rt'}) + r\cdot\bar{F}e^{-rt'}[(e^{-rt'}/t') -r]}{+(\bar{L}+m_o)\ (1-e^{-rt'})\ [(e^{-rt'}/t') -r]\}}{(1-e^{-rt'})\ [(e^{-rt'}/t') - r]^2}$$

$$\phi_4 = -\phi_1 -\phi_2 -\phi_3$$

$$\phi_5 = \frac{-\Theta}{(e^{-rt'}/t') - r}$$

Although the above expression for the present value, PV(t), of the landlord's investment is quite complex, it is nevertheless appropriate to see how the landlord might optimize the two parameters, Θ and t, which are under his control. Theoretically, the landlord's problem can be solved using calculus. Consider the selection of the optimal maintenance parameter, Θ. This will be a value, Θ^*, which satisfies the equation

(26)
$$\frac{\partial PV(t)}{\partial\Theta} = 0$$

The problem of finding the optimal duration, t*, for the project is somewhat more complicated.

Since it was assumed that the financial arrangements for the project would be coterminous with the project, it is required that $t = t'$. Imposing the latter constraint by using the method of Lagrange leads to the equation

(27) $$\frac{\partial PV(t)}{\partial t} = -\frac{\partial PV(t)}{\partial t'}$$

In solving this equation t is replaced by t'. The resulting value of t' which solves (27) (and maximizes PV(t)) is designated as t*. In practice a search procedure would probably be used in order to find the optimum values Θ^* and t*.

Having found the optimal values of Θ^* and t*, the landlord is then in a position to compute an optimal present value, $PV(t^*)^*$, with which he can decide, using inequality (16), whether or not he will invest in housing. One point which was neglected in this discussion was that one of the parameters, $\overline{c}$, which the landlord needs to make his calculations is only determined within the context of the stock and flow analyses which are the subjects of the next two sections.

Housing Market Flow Equilibrium

For simplicity, it is assumed that the long-run supply curve for the construction industry is

(28) (Cost per unit) = $b_0 + b_1 \cdot N$, where N is the annual volume of construction, and b_0 and b_1 are parameters with $b_1 > 0$.

In addition, the (average) landlord's decision criterion (16) can be rewritten as (16)' (Cost per unit) = $PV(t^*)^* - (D-\overline{F})$, where
D is (Pro-rated Demolition Cost per unit)
$\overline{F}$ is (Borrowings per unit)
Equating the two expressions, and solving for N gives the annual flow of new housing construction

(29) $$N^* = [PV(t^*)^* - (b_0 + D - \overline{F})]/b_1$$

Since the model deals with the long-run equilibrium position of the housing market, it was thought appropriate to have both a fixed number and distribution (by income) of households. As a result, the annual flow of new construction, N*, represents only replacement construction. However, population growth and the consequent existence of a new household demand can be worked into the model without great difficulty.

Housing Market Stock Equilibrium

In the context of this model, quality (or age) is the one attribute by which one unit of housing can be distinguished from another.

Consequently, one way of handling the equilibrium demand for the housing stock is to equate the supply and demand for housing within each increment of housing of a given quality (or age). The implementation of this approach is the objective of this section.

The increment of the housing stock (supply) within the age bracket t to (t + Δt) is

$$N_s = \int_t^{t+\Delta t} (dN/dt) \cdot dt \tag{30}$$

where (dN/dt) is the amount of new housing construction per unit of time as a function of the time when it was built (its present age). On the basis of the analysis of the previous section, it is assumed that (dN/dt) equals N*. As a result, at age "t"

$$N_s = N^* \cdot \Delta t \tag{31}$$

Deriving the stock demand for housing of age t to (t + Δt) is somewhat more involved. Let the function J(y) represent the number of households with incomes that are less than or equal to "y". (In effect, J(y) is a cumulative income distribution function.) Since the market price-age function coincides with a "bid-rent" function of each and every household, the individual household is indifferent between buying a lot of poor quality housing or a smaller amount of good quality housing.[13] One implication of this situation is that the distribution of households can be matched up with the housing stock in either of two ways:

(32a) As y increases, households purchase newer, higher quality housing - (a traditional result).

(32b) As y increases, households purchase older, lower quality housing - (an anti-traditional result).

Adopting the traditional result gives the following expression for the demand for housing in the age bracket t to (t + Δt)

$$N_D = [J(y) - J(y+\Delta y)] \cdot N[y(t), P(t)] \tag{33}$$

where the first term on the RHS represents the number of households with incomes between (y + Δy) and y, and the second term stands for the household's housing demand function (14a). An alternative way of writing the first term is as follows

$$-[J(y+\Delta y) - J(y)] = -(dJ/dy) \cdot \Delta y \tag{34}$$

Equating the supply and demand for housing gives

$$-(dJ/dy) \cdot \Delta y \cdot N[y(t), P(t)] = N^* \cdot \Delta t \tag{35}$$

Dividing both sides by Δt, and letting (Δy/Δt) equal (dy/dt), as Δt becomes arbitrarily small, gives after rearranging terms

$$\frac{dy}{dt} = -N^* \cdot \frac{1}{(dJ/dy)} \cdot \frac{1}{N[y(t), P(t)]} \tag{36}$$

Assume that

$$J(y) = a_0 + a_1 y \text{ for } y_{min} < y < y_{max} \tag{37}$$

This implies that $(dJ/dy) = a_1$. In addition, it is to be recalled that (18) $P(t) = \bar{c} \cdot e^{qt}$ and (14a) $N[y(t), P(t)] = [y(t)/P(t)] \cdot [\beta/(\alpha+\beta)]$. Substituting these explicit functions into (36) leads to

$$\frac{dy}{dt} = \frac{-N^*}{a_1} \cdot \frac{\bar{c}}{y(t)} \left(\frac{\alpha+\beta}{\beta}\right) e^{qt} \tag{38}$$

Integrating and solving for y results in the following income-age relationship

$$y = + \left\{\left[\frac{-2N^*}{a_1} \cdot \frac{\bar{c}}{q} \left(\frac{\alpha+\beta}{\beta}\right)\right] e^{qt} + c'\right\}^{1/2} \tag{39}$$

The constants $\bar{c}$ and c' are derived, using the two sets of boundary conditions

(40a) $t = 0$, when $y = y$ max.

(40b) $t = t^*$, when $y = y$ min.

Specifically,

$$(y_{max})^2 = \left[\frac{-2N^*}{a_1} \cdot \frac{1}{q}\left(\frac{\alpha+\beta}{\beta}\right)\right] \bar{c} + c' \tag{41}$$

$$(y_{min})^2 = \left[\frac{-2N^*}{a_1} \cdot \frac{1}{q}\left(\frac{\alpha+\beta}{\beta}\right) e^{qt^*}\right] \bar{c} + c' \tag{42}$$

provide sufficient conditions for their determination. The more fundamental constant c is then found using the relation

$$c = \bar{c} \,/\, Q_o^{\gamma/\beta} \tag{43}$$

Altogether equations (26), (27), (25), (29), (41) and (42) as a system determine the values of the parameters Θ^*, t^*, $PV(t^*)^*$, N^*, $\bar{c}$ and c'. These latter parameters characterize the long-run equilibrium position of the housing market.

Tentative Observations About the Housing Market

The primary justification for trying to explain housing quality, using a somewhat complicated "total" housing market model, stems from the belief that partial models are inadequate for the task. At least for a long-run analysis; the pervasiveness of the filtering process makes suspect those models which artifically segment the housing market.

However, this position is not espoused for the purpose of covering over the model's more serious deficiencies. Some of its shortcomings are listed below.

(1) It fails to deal with the impact of spatial location upon housing investment.
(2) It employs an unrealistic household preference function.
(3) It fails to allow for the strong impact which income taxes have upon investments in housing.
(4) Its assumptions about financial arrangements are very restrictive.
(5) It does not allow for changes in population or income distributions.
(6) It unrealistically assumes that all new housing is occupied by persons at the top end of the income distribution.

However, in spite of such difficulties, it is maintained that the model still has something to offer to the policymakers who is concerned with housing quality. Simulation experiments with such a model might well provide some reasonable assessments of the relative impacts of alternative programs. And at the same time such simulations might aid in the development of better programs. For example, using an after income-tax version of the model, it might be possible to design tax programs which effectively stimulate maintenance expenditures. In any case, it is important that programs which are aimed at raising the quality of the private housing stock should take advantage of market forces, and not work ineffectually against them.

FOOTNOTES

[1]For simplicity, it is assumed that all new housing is of "good" quality, and that if housing were adequately maintained in "like new" condition, then there would be no problem with the physical quality of housing.

[2]Housing quality need not be viewed in this way; however, an alternative approach which views poor quality housing and good quality housing as distinct goods "passes the buck" to a framework with a relatively unmanageable continuum of cross-elasticities of demand.

[3]Some persons would judge the quality of housing solely on the basis of "items" which provide for the health and safety of the housing units occupants. However, a concept of quality which relates more directly to the market decisions of consumers seems more appropriate to the author.

[4]Of course, problems may exist either with the instructions for measuring housing quality or with the enumerators who do the measuring.

[5]In the Bureau of the Census's Working Paper No. 25, Measuring the Quality of Housing: An Appraisal of Census Statistics and Methods, the reliability of it's housing quality statistics for its two bottom segments was given as 1/3. Although the particular assumptions used here will not allow such a low value, their result can be thought of as requiring a negative value for "a".

[6]See The American Public Health Association, An Appraisal Method for Measuring the Quality of Housing: A Yardstick for Health Officers, Housing Officials and Planners, N.Y. 1945.

[7]Whether or not "environment" is a legitimate part of housing quality is a matter of some dispute.

[8]Op. cit. APHA, An Appraisal Method... pp. 66-67.

[9]See Morris, Earl and Woods, Margaret "The Measurement of Housing Quality", unpublished manuscript.

[10]Within an interval scale framework one might talk about the existence of fixed ratios of "items".

[11]See Alonso, W. Location and Land Use: Toward a General Theory of Land Rent, Harvard University Press, Cambridge 1964, pp. 59-75.

[12]See Beckmann, M., "On the Distribution of Urban Rent and Residential Density", Journal of Economic Theory 1, 60-67 (1969).

[13]Appendix C develops some preliminary results for an alternative household utility function that guarantees that higher income households will obtain newer, higher quality housing.

Appendix A: Derivation of the Expected Reliability Statistic: E(R)

It is helpful to approach the derivation of E(R) by thinking in terms of a bivariate probability distribution f(K,R) which is continuous in the direction of K (the ordinal level of quality) and discrete in the direction of R (the event "1" that a choice is in the "class" and the event "o" that a choice is not in the "class".) In fact, it is easiest to proceed by computing

(A-1) $$E(R) = E(E(R/K))$$

which is the expectation of the conditional expectation of R, given K.

In symbolic terms this expectation is represented in the following way

(A-2) $$E(R) = \int_{K_1}^{K_1+(a+2b)} f_1(K) \cdot E(c/K=K)dK, \text{ but}$$

(A-3) $$E(R) = \int_{K_1}^{K_1+(a+2b)} f_1(K) \{\sum_{i=1}^{2} R(c) \ [P(i)/K=K]\}dK$$

However, R(2) = 0 and R(1) = 1 so that

(A-4) $$E(R) = \int_{K_1}^{K_1+(a+2b)} f_1(K)[P(1)/K=K]dK = 1 - \frac{b}{3(a+b)}$$

where in the intervals

1st: K to (K_1+b+a)

2nd: (K_1+b) to (K_1+b+a)

3rd: (K_1+b+a) to (K_1+2b+a)

the functions are defined as

A) (Ideal) Master Sample Distribution: $f_1(K)$

$= \{\frac{-K_1}{b(a+b)} + \frac{K}{b(a+b)}\}$ in 1st interval

$= \{\frac{1}{(a+b)}\}$ in 2nd interval

$= \{\frac{[K_1+(a+2b)]}{b(a+b)} - \frac{K}{b(a+b)}\}$ in 3rd interval

B) Conditional Probability Function: $[P(1)/K = K]$

$$= \frac{-K_1}{b} + \frac{K}{b} \qquad \text{in 1st interval}$$

$$= 1 \qquad \text{in 2nd interval}$$

$$= \frac{[K_1 + (a+2b)]}{b} \quad \frac{-K}{b} \qquad \text{in 3rd interval}$$

Appendix B: Derivation of the Auxiliary Functions Representing the Landlord's Financial Arrangements

I) Amortization of Debt (Borrowings per unit):

Assume that over time a decreasing amount of debt

(B-1) $$A(t) = \overline{A} \cdot e^{-rt}$$

is being paid back. However, using the relationship

(B-2) $$\overline{F} = \int_0^{t'} \overline{A} \cdot e^{-rt} dt$$

gives

(B-3) $$A(t) = \frac{r \cdot \overline{F}}{(1-e^{rt'})} \cdot e^{-rt}$$

II) Interest Charges to be Paid on Outstanding Debt:

It is assumed that

(B-4) $$I(t) = r \cdot \{\overline{F} - \int_o^t A(t)\, dt\}$$

Substituting in the value of A(t) (i.e. (B-3)), gives

(B-5) $$I(t) = \frac{r \cdot \overline{F}[e^{-rt} - e^{-rt'}]}{[1 - e^{-rt'}]}$$

III) Sinking Fund Arrangements

Assume that an increasing amount

(B-6) $$S(t) = \overline{s} \cdot e^{rt}$$

is allocated to the fund over time, and that funds so allocated earn interest until time t' (The termination date for the project.) The following relation holds

(B-7) $$PV = \int_o^{t'} (\overline{s} \cdot e^{rt}) e^{r(t'-t)} dt$$

which after solving for $\overline{s}$ gives the expression for S(t) as

$$S(t) = \left(\frac{1}{t' e^{rt'}}\right) e^{rt} \cdot PV$$

Appendix C: Some Implications of an Alternative Household Preference Function

Suppose that the following expression represents the household's preference "map" for housing quality, Q, housing quantity, N, and "other goods", X.

(C-1) $$U = X^{\alpha}(\ln N)^{\beta} Q^{\gamma}$$

The idea behind this preference function is that households more rapidly approach satiation in their purchases of housing quantity, than they do in their purchases of "other goods" or of housing quality.

The budget constraint y - X + NP together with the method of Lagrange leads to the following first-order conditions for the maximization of (c-1).

(C-2a) $$L_X = (\alpha/X)X^{\alpha}(\ln N)^{\beta} Q^{\gamma} - \lambda = 0$$

(C-2b) $$L_N = (\beta/N)(1/\ln N)\, X^{\alpha}(\ln N)^{\beta} Q^{\gamma} - \lambda \cdot P = 0$$

(C-2c) $$L_Q = (\gamma/Q)\, X^{\alpha}(\ln N)^{\beta} Q^{\gamma} = 0$$

(C-2d) $$L_t = (\gamma/Q)(dQ/dt)X^{\alpha}(\ln N)^{\beta} Q^{\gamma} - \lambda \cdot N(dP/dt) = 0$$

(C-2e) $$L_{\lambda} = -(X + N \cdot P - y) = 0$$

Unfortunately, it is not possible to solve explicitly for N as a function of y and P, since (C-2a) and (C-2b) lead to the troublesome function

(C-3) $$y = N \cdot P\, [1 + (\alpha/\beta)\ln N]$$

where $0 < \alpha, \beta < 1$ and $\beta = 1 - \alpha$.

However, for $N > 1$ expression (C-3) becomes the product of two positive monotonic functions, and thus for that range of N, it is meaningful to talk of N as a single-valued function of y and P.

It is fruitful to examine the household's condition for equilibrium between housing of different ages (qualities).

(C-4) $$(dP/dt) = (\gamma/\beta)\,(P/Q)\,(dQ/dt) \cdot \ln N$$

This expression for the slope of the household's "bid-rent" function is dependent upon income, since the equilibrium quantity N is income dependent. Given this condition, if it also turns out that the partial derivative of (dP/dt) with respect to income is negative, it can then be demonstrated that higher income households will necessarily end up in the new, higher quality housing. This result occurs because, whenever the partial $\partial(dP/dt) / \partial y$ is negative, the steepness of the household's bid-rent curves will increase with its income level. In fact, the partial derivative $\partial(dP/dt) / \partial y$ is negative

(C-5)
$$\frac{\partial(dP/dt)}{\partial y} = \frac{\partial dP/dt)}{\partial N} \cdot \frac{1}{(\partial y/\partial N)}$$

$$= (\gamma/\beta)\ (P/Q)\ (dQ/dt)\left(\frac{1}{N \cdot P}\right) \frac{1}{[1+(\alpha/\beta) + (\alpha/\beta)\ln N]}$$

$$(+)\quad (+)\quad (-)\quad (+)\qquad (+)$$

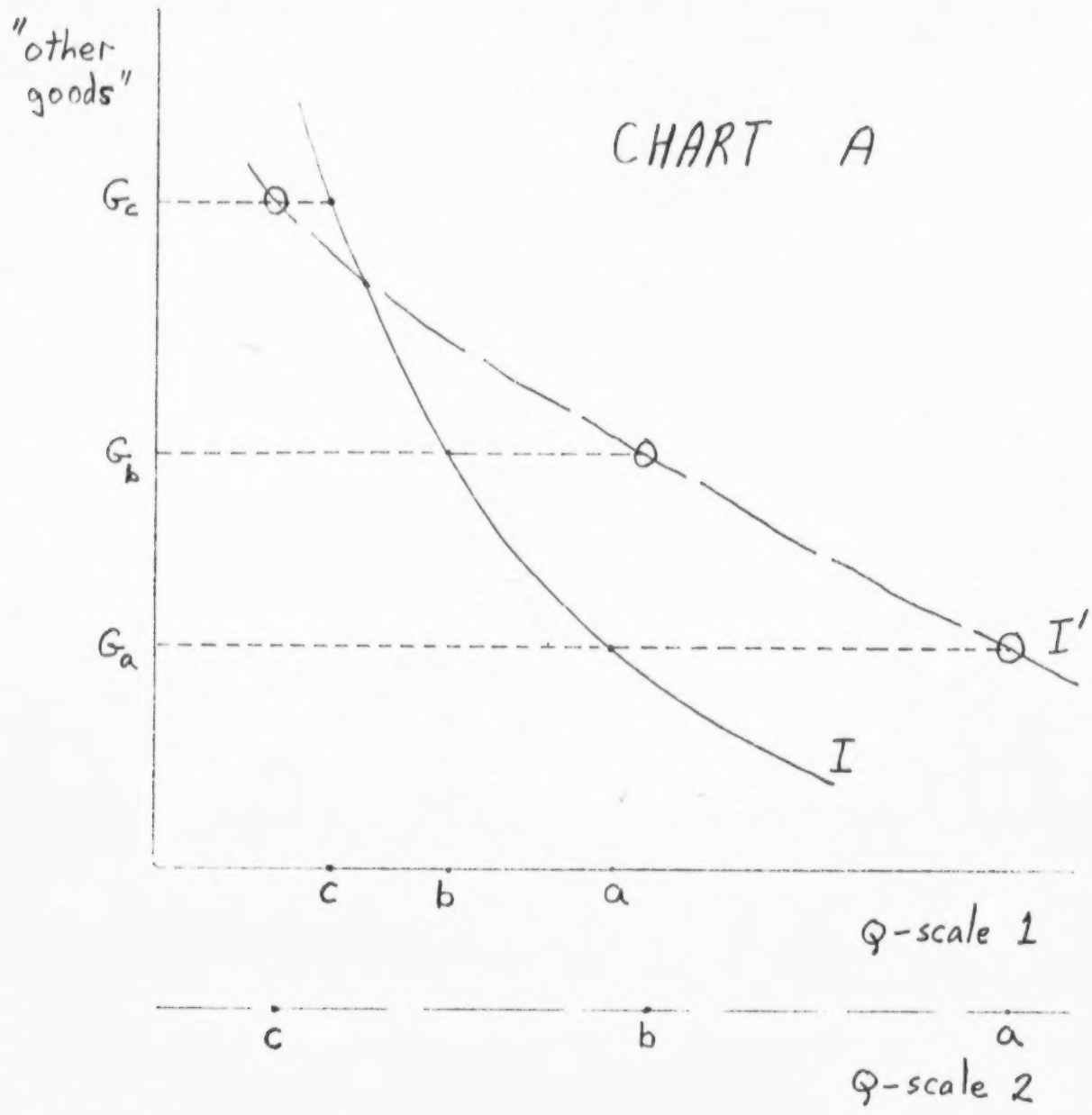
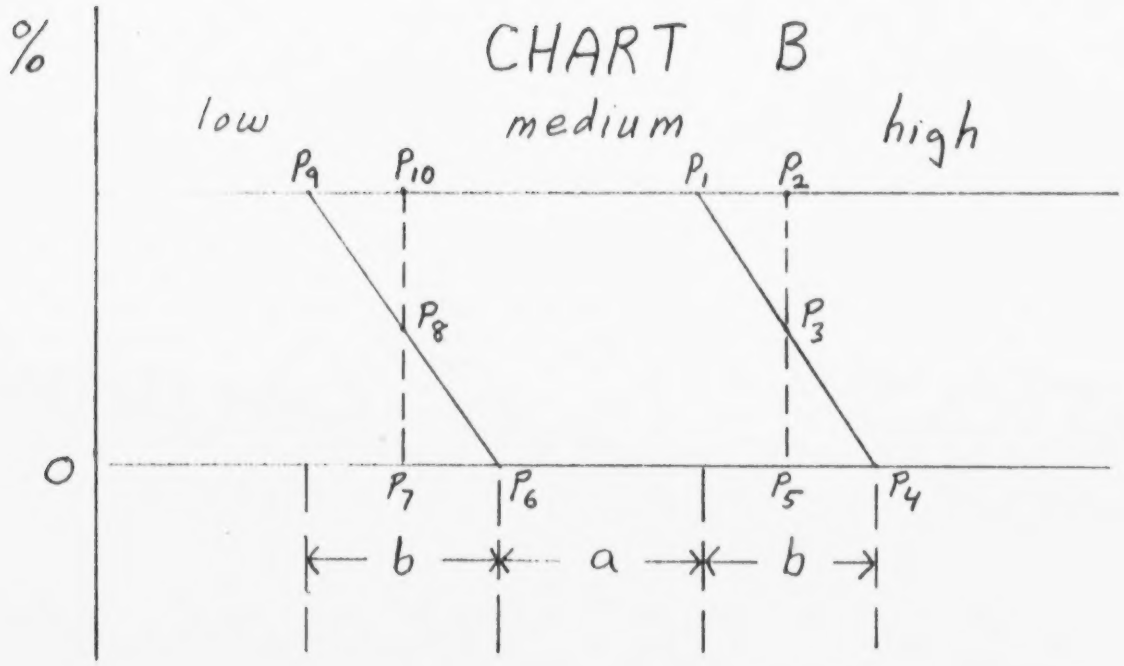


CHART A



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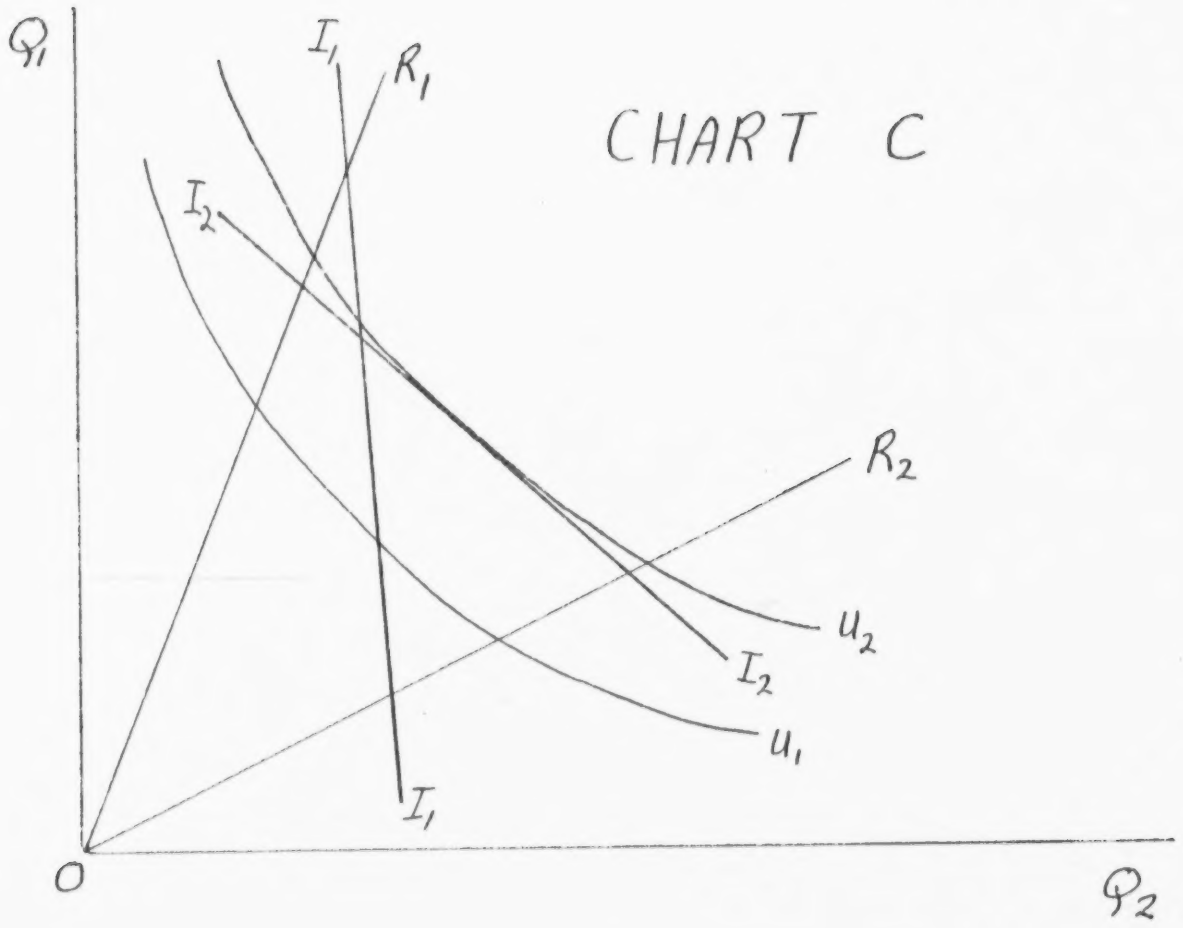

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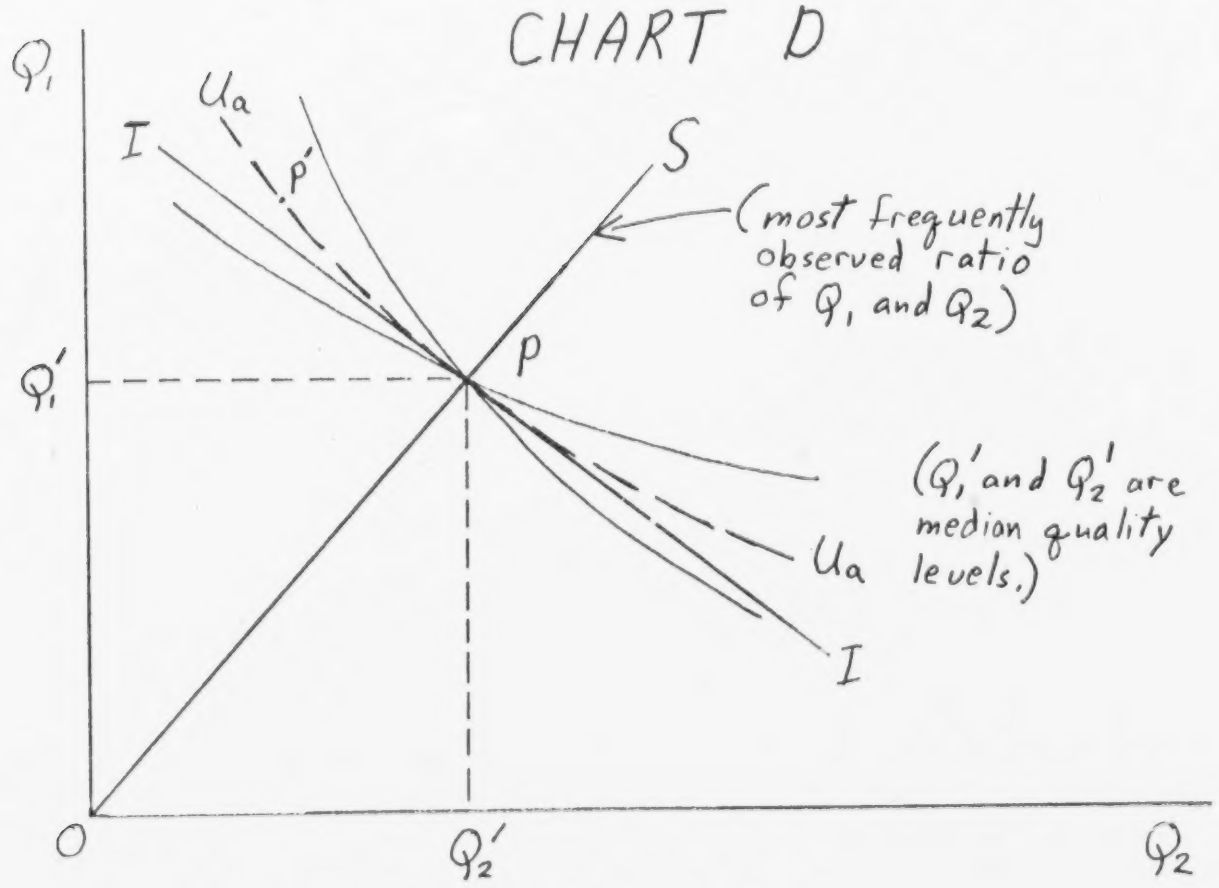
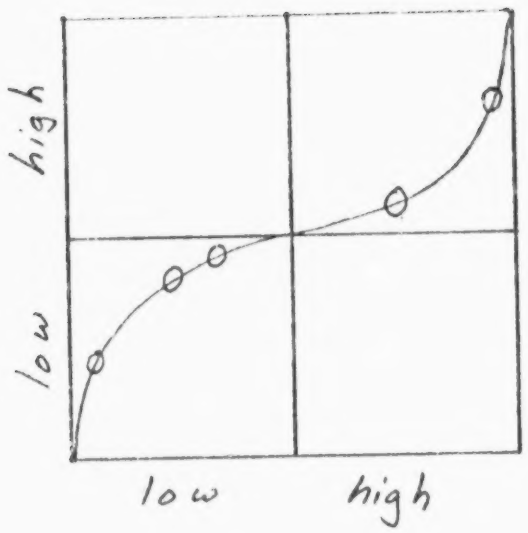


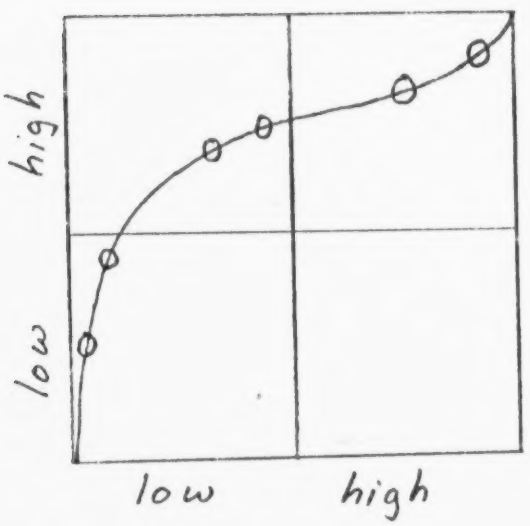
CHART D

CHART E



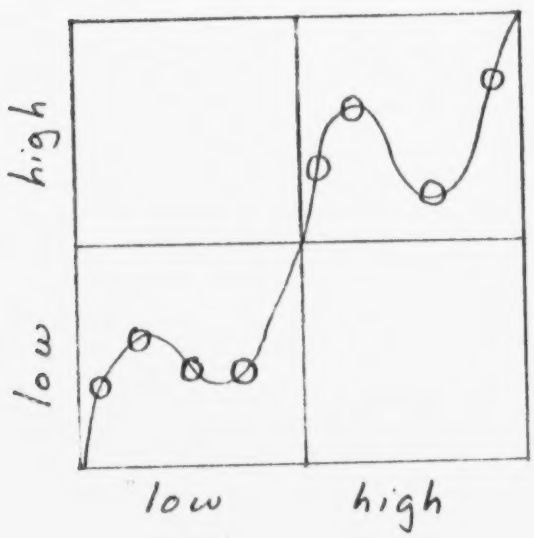
Case 1

- perfect rank correlation on a continuous scale
- perfect rank correlation on a segmented scale



Case 2

- perfect rank correlation on a continuous scale
- imperfect rank correlation on a segmented scale



Case 3

- imperfect rank correlation on a continuous scale
- perfect rank correlation on a segmented scale

CHART F